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## EXERCISE AND PREGNANCY: A REVIEW STUDY

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### ABSTRACT

In recent times, researchers, exercise advocates and other professional experts in women's health are agitating for women participation in exercise programme. Reasons for this advocacy might not be unconnected to the fact that the benefits of exercise for women far outweigh the complications particularly in pregnancy. This paper review significance of exercises during pregnancy. The review revealed that it is unrealistic for pregnant women to participate in vigorous physical activity, but could benefit from antenatal physiotherapy. It is also apparent that female athletes tend to have fewer pregnancy and child birth related complications than do normal non athletic women. This is suggestive that women should be physically active but pregnant women continue to participate in activities which they are familiar with, while regular participation of women of reproductive age in exercise and sports is highly encouraged.

**Key words:** Pregnancy; Exercise.

### INTRODUCTION

It has been suggested that participation in athletic competition, training or vigorous sports should be forbidden during pregnancy. This is basically because reason is that, the work of the right atrium and ventricle of the heart is increased three fold and the work of the left atrium and ventricle is increased two fold even in non pregnant female by a moderate work load (Klaus, 1961). During pregnancy, such an increased with the demand of the fetal circulation could be hazardous to the heart and lung circulation. The danger would be especially great if unrecognized heart defects are present (Klaus, 1961).

However, later findings seem not to support this reasoning. Knuttgen and Emerson (1974) found no evidence of ventilatory impairment or dyspnea and reported that exercise does not constitute a more severe physiological stress in women during rest and moderate exercise. Erkkola (1976) in his work on the effect of exercise on 62 healthy young women in their first pregnancy beginning

in the 10<sup>th</sup> or 14<sup>th</sup> week of pregnancy and lasting until term, observed that increase in physical work capacity during pregnancy was 17.6% greater in the training group, who showed no negative effects from the training programme. Dressendorfer (1978) reported that during normal pregnancy and lactation, VO<sub>2</sub> max and endurance performance can not only be maintained but even be improved by physical training without any harmful effect on the mother or child. This finding was supported by the reports by Dressendorfer and Goodlin (1980) and Hutchinson et al (1981). The paper is to focus on the effect of exercise on pregnancy.

### Advantages and Disadvantages of Exercise in Pregnancy

Various studies (Clapp, 1994; Dwak, Jovanoric-Petersan and Peterson, 1990; Okuneye, 2002; Clap, 1991; Dashe, 2001; Wolfe et al, 1994; Clapp and Capless, 1991) have reported the benefits and disadvantages of exercise on pregnancy and are stated as follows:

Exercise is beneficial in the maintenance of maternal fitness and fewer stretch marks by increasing muscle strength and flexibility. Exercise also prevents excess weight gain and fewer complications during labor and shorter delivery. Exercise ensures rapid recovery after birth and enhancement of thermal, metabolic, endocrine and cardiovascular adaptations to pregnancy (The American College of Obstetrics and Gynecology [ACOG], 1994). It also prevents pregnancy discomforts such as backache, and provides some psychological benefits such as better relaxation and attainment of positive self image. Low risk of toxemia (gestational hypertension), prevention of the development of varicose vein, piles, depression, insomnia, hyperlipidemia and gestational diabetes are among the several benefits of exercise during pregnancy. However, there are also many disadvantages of exercise during pregnancy and they included: reduced uterine blood flow and fetal hypothermia if exercise is endurance type, fetal hypoxia if exercise is anaerobic type, hypoglycemia and disruption of endocrine homeostasis, risk of maternal musculoskeletal injury, have been reported as the major challenges associated with exercise during pregnancy (ACOG, 1994).

#### **Recommended Physical Activities/ Sports Activities during Pregnancy and Exercise Tolerance (stress) test**

ACOG, (1994) recommended walking, Jogging, stationary cycling, low impact aerobic exercise and swimming during pregnancy. However, hockey (field and ice), boxing /wrestling and football (soccer) are discouraged. Exercise stress test such as treadmill test are necessary and recommended prior to exercise participation in the general population (Lowensteyn, Joseph and Grover, 1997). Stress tests are not normally used during pregnancy, since pregnancy is a form of stress test. However, they may be useful in a woman contemplating pregnancy if the degree of compensation and ability to carry a pregnancy to term are in doubt or to investigate the cause of chest pain and certain arrhythmias (Synunous, 1987).

#### **Body System Responses to Exercise during Pregnancy**

##### **Exercise VO<sub>2</sub> max and pregnancy**

During pregnancy the VO<sub>2</sub> max is increased by about 10% and return to control value after parturition, However, during exercise (training mileage) the VO<sub>2</sub> max fell as the mileage fell (Araujo, 1997). The VO<sub>2</sub> max and endurance performance cannot only be maintained but even be improved by physical training without harmful effects on the mother or child (Araujo, 1997).

##### **Energy Cost of Pregnancy**

Pregnancy increase the energy cost of daily activities, therefore, pregnant women becomes de-conditioned as they approach term. The result is often chronic fatigue and backache, pregnancy has a higher energy cost because of the metabolic needs of the fetus. Metabolic rate increases and it takes more energy to move the larger body mass. The caloric cost of activities is higher during pregnancy than when not pregnant. Most obstetricians recommend an average weight gain of 11-16kg; however, there are large individual differences in ideal weight gain (Brooks, Fahey and White, 1996).

##### **Cardiovascular Responses to Aerobic Exercise in Pregnancy:**

The cardiovascular impact of the dual stresses of exercise, pregnancy has been the focus of most investigations (). Relative to pregnancy level, the cardiac output increases up to about 50%, heart rate increases to about 15 beats per minute at rest and increase in blood volume by 45% in the third trimester. These increases are off set to some extent by an increased capacity of the veins, resulting in stable or reduced blood pressure, and the greater vasodilatation at the skin, resulting in greater heat loss and a reduced tendency for hyperthermia (Araujo, 1997).

The demands of exercising muscles divert blood flow from the utero-placental unit, raising the theoretical risk of fetal hypoxia. In reality, compensatory changes with exercise occur; such as increased

maternal hematocrit and oxygen supply. Extraction appears to prevent impairment of fetal oxygenation (Sternfeld, 1997). The supine position is associated with decreased maternal cardiac output after the first trimester this had led to the campaign against exercise in this position. The metabolic cost of standard sub maximal exercise is not greatly affected by pregnancy, but heart and pulmonary ventilation are significantly increased. According to Wolfe et al (1989).during mild to moderate sub maximal exertion, stroke volume and cardiac out put are augmented progressively until late gestation. In late gestation, depending on maternal posture, venous return, stokes volume and cardiac out put are reduced as a result of compression of inferior vena cava by the gravid uterus. It has been reported that physical condition would reduce both heart rate and rating of perceived exertion during strenuous steady state exercise (Wolfe et al, 1989).

#### **Pulmonary Function and Pregnancy**

Ventilation increases during sub maximal exercise in pregnancy as a result of changes in tidal volume rather than breathing frequency. As pregnancy continues, respiratory sensitivity to partial pressure of CO<sub>2</sub> increases. This helps to maintain respiratory responsiveness during pregnancy. The work of breathing is higher during late gestation due to restriction of the diaphragm. Dyspnae a common complaint during late pregnancy many contribute to the decreased activity patterns observed in some women (Araujo, 1997; Sady, 1990; Artal et al, 1947).

#### **Musculoskeletal System**

Multiple adaptations of the musculoskeletal system can affect the ability to exercise. The anterior displacement of the enlarging uterus changes the woman's centre of gravity and exaggerates normal lumbar lordosis. Increase in hormone levels, especially progesterone and relaxin promote ligament and joint laxity, while breasts enlargement may also affect their centre of gravity. During pregnancy, the center of gravity shift inferiorly and posterior to the

lumbar spine because of the enlarging uterus. The increased weight as a result of pregnancy may contribute to upper limb and shoulder pain.. All these changes may cause problems with balance; poor balance coupled with sudden movements may exacerbate mechanical difficulties and increase the potential for injury (Araujo, 1997; Wang and Apgar, 1998; Calguneri, Bird and Wright, 1982; Artal and Sherman, 1999). However, an increased injury rate in pregnant women as a result of poor balance has not been documented (Wang and Apgar, 1998).

#### **Indication for Exercise in Pregnancy Exercise**

Exercise should be encouraged if is the usual habit of the woman and if pregnancy is progressing normally, but if the expecting woman normally take no exercise beyond house work there no need to change her sedentary lifestyle but could benefit from purposeful antenatal exercise by physiotherapy. Swimmers and runners should continue while pregnant (Collins, Curet and Mullin, 1983). However, it should be noted that pregnant women come from diverse exercise background some are recreational athletes, some are fitness enthusiasts while others are competitive athletes. To appropriately counsel these patients, it is important to understand these factors.

#### **Contra indication to Training During Pregnancy**

There are few contra indications, although there are practical difficulties in the third trimester. Some activities are contra indicated such as horse riding, diving and water skiing as earlier stated. Medical and other pregnancy related abnormalities such as ischemic heart disease, hypertension and pregnancy induced hypertension, diabetes, multiple pregnancy, anaemia, bleeding, severe chest condition such as asthma are contraindicated. Pregnant woman should avoid contact sports and sports that pose unknown physiological effect on the fetus for example scuba diving, mountaineering at high attitude, high intensity sports involving rapid change of direction should be avoided (ACOB, 1994; Araujo, 1997;

Wang and Apgar, 1998; Artal and Sherman, 1999). Weight lifter may need to modify their routine and weight lifting should be avoided in third trimester. Competitive exercise during febrile illness is contraindicated, while, team sports participation is acceptable only in the first 15 weeks of pregnancy (Araujo, 1997).

### **Pregnancy and Competition**

Professional athletes have been known to compete during the first three or four months of their pregnancy. To buffer this, the female bronze medalist in swimming in the 1952 Olympic was pregnant. Exercise has been shown not to constitute a more severe physiological stress during pregnancy than before, provided lifting activities are minimized (Fox and Mathew, 1987).

### **Exercise and Fatal /Neonatal Complication**

Veile et al (1985), Pivarnilk (1998); Wolfe et al (1994) reported low rates of spontaneous abortion, premature delivery, low birth weight infants, low fetal malfunctions and low major neonatal complications in women performing endurance exercise during pregnancy. Other studies (Collins et al, 1983; Berkowitz, 1983) showed that pregnancy outcome of woman who participated in aerobic exercise program as compared to inactive controls was not different as far as labor duration and Apgar scores or fetal growth is concern.

### **Effects of Pregnancy and Child Birth on Subsequent Athletic Performance**

It is belief that pregnancy can improve subsequent sporting performance. There are many examples of athletes who have performed better following return to competition after pregnancy. Reason for this belief, is that the cardiovascular stress of carrying baby has a training effect. Others suggest that in gifted athlete who has competed all her life, the enforced rest associated with pregnancy refreshes athlete and improves her enthusiastic for sport, though, the mechanism may be psychological (Macauley, 1995). Another reason is that increased flexibility enhances the activities of the athletes.

During pregnancy, hormones called relaxin and progesterone are released to facilitate the opening of the birth canal during delivery. Relaxin increases the flexibility of the body's soft tissue and this effect persists after pregnancy. However, it is extremely difficult to quantify the effect of increased flexibility and performance (Brooks et al, 1996).

Pregnancy appears to have a greatest impact on weight bearing exercise. A study on active trained runners (Clapp and Little, 1995) revealed a progressive decline in all aspects of performance during pregnancy. Many of these women stop exercising voluntarily by the third trimester, because of fatigue, nausea and morphological changes associated with pelvic pressure and discomfort. Reduction in exercise performance capacity stabilizes at 50% of pre-pregnant levels by the 6<sup>th</sup> month of gestation (Clapp, 1989). This pattern of decreased performance is not associated with non weight bearing exercise such as cycling or swimming, because pregnant women who engage in non weight bearing exercise are able to maintain high intensity, moderate duration exercise with no decline in overall performance (Collings et al, 1983; Sibley, 1981).

### **Effects of Exercise Programme on Labor and Delivery**

There are two schools of thought concerning the effect of exercise or athletic participation on pregnancy and child birth. One opinion is that because of the hypertrophy of the pelvic musculature accompanying sport participation, the muscles become less extensible and thus cause difficulties during labor and delivery. The other theory emphasizes the favorable effects of strong abdominal muscles as a result of exercise on labour and delivery (Fox and Mathew, 1987). Female athletes tend to have fewer pregnancy and childbirth related complication than do normal non-athletic women (Devries and Housh, 1994). Investigations on women who continue to participate in regular sustained aerobic exercise throughout the pre-conceptual period failed to detect any increase in

incidence of infertility. Although, there seems to be dearth of information on the impact of starting exercise programme in early pregnancy is scanty, vigorous exercise throughout the first 20 weeks of pregnancy does not increase the risk of spontaneous abortion, ectopic pregnancy or other disorders of placenta (Clapp, 1994).

Durak et al (1990) reported that subjects uterine activity seems to increase during and immediately after sustained aerobic exercise in the mid and late pregnancy. However, it is not always possible to find its presence. Also no scientific evidence has been reported to show that starting or continuing an exercise programme during pregnancy increases the incidence of labor before 37½ weeks of gestation or membrane rupture before labor (Araujo, 1997; Wolfe et al, 1994; Thomas and Barbara, 1998).

#### **Prescribed Exercise During Pregnancy**

Most experts recommend that women should not start an exercise programme while pregnant but continue to participate in activities which they are familiar with. Some exercises are prescribed specifically for peri and post natal periods. For those who have not been exercising prior to pregnancy, the place of antenatal purposeful exercise inform of physiotherapy classes will assist circulation and breathing, while gentle mobilize joints may keep the freedom of the muscle stretch available and teach control and relation of muscles of the pelvic floor (Taylor et al, 2007).

In general, more strenuous forms of exercise like swimming or golf will depend on individual. If the pregnant woman is accustomed to such exercise, then there is no reason not continuing in the first half of pregnancy (Walker, MacGillary and MacNaughton, 1976). It is generally recommended that healthy women whose pregnancy is progressing normally should maintain a physical training schedule that will achieve 60 to 80% of her calculated maximum heart rate for not more than three times a week (Morton, Paul and Metcalfe, 1985). Lokey et al (1991)

reported that an exercise programme using variety of exercise modes performed for an average of 43 minutes daily or 3 times per week at a heart rate of 144 beats per minute would not adversely affect the mother or fetus in a healthy normal pregnancy. However, these findings should be cautiously applied. While core temperature should not be allowed to rise above 38.9°C (Brooks et al, 1996), Bonfligo (1994) recommended that during pregnancy, the target HR during exercise should be set around 25% lower than the level for the general population.

Available research evidence suggests that the risks of reproductive and musculoskeletal problems linked with high intensity exercise are more than those resulting from moderate exercise (Blair, 1989). Moreover, it is not realistic to expect sedentary pregnant women to regularly participate in an exercise programme that involves prolonged periods of intense physical activity, however and whatever may be the health benefit (Dashe, 2001). ACOG (1994) endorsed the safety of most aerobic exercise but placed definite limits of 15 minutes duration and heart rate of 140 beats per minute. Regular moderate intense physical activities such as brisk walking, jogging, swimming, golf in most days of the week for 30 minutes a day is a realistic and visible goal. However, this does not mean that those who can afford high intensity exercise should not participate (Blair, 1989). The view is that adequate warm up prior to and cool down after exercise is essential to prevent injury and to decrease metabolic system to resting condition respectively (Noble, 1986). Patients with multiple gestations are significantly risk of premature labor, and if they have additional risk factors, the aggregate risk is higher. Exercise programme for women with multiple gestations should therefore be individualized and medically supervised, so also, those who are excessively obese. Artal (2003) stated that 50-60%  $VO_{2max}$  or 80% HR max produce no adverse effect, but playing safe is better.

## CONCLUSION AND RECOMMENDATION

Exercise is safe and beneficial in the absence of medical and obstetric conditions in pregnancy. Sedentary women should not start an exercise programme while pregnant, but could participate in antenatal purposeful exercise by physiotherapy classes. However, those who are physically active should continue in the activities or exercise programme which they are familiar with in accordance with guidelines, precautions and recommendation of experts and specialists. However, regular participation of African women of reproductive age in exercise and sports is recommended and should be encouraged by both Government and non governmental organization (NGOs). Incorporating antenatal exercise in the antenatal, family and child birth programmes in Africa would be a major step.

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