Aquatic Sports and Pregnancy

Dear Doctor:

I am 24 years old. I am a swimmer. I am pregnant and wish to continue swimming. Is this o.k.?

Should a pregnant woman exercise?
Is it safe?
Will there be a problem with the baby or the pregnancy if she exercises?
Are there any precautions or guidelines available?

These are important questions that I encounter regularly in my sports medicine practice. As obesity is a growing epidemic in many of the world's populations, people are adopting fitness as a lifestyle change to improve

their health. However, pregnancy is a unique time in a woman's health when special precautions must be taken. Pregnancy is also a time that is clouded with superstition and an abundance of folklore advice that is not based on scientific evidence.

For this edition of the FINA Magazine, I will explore this different avenue of health in the female aquatic athlete.

Over 50% of aquatic athletes are female. Pregnancy is an issue that faces most women at some time in their lives. Many of our competitive athletes are in their reproductive years, and pregnancy is an issue that may be a concern for them. There are also many active Masters athletes who are training and competing during their reproductive years. For the retired athlete, swimming is a sport that they may wish to continue on a recreational level for health and fitness.

In this article, I will review the most recent scientific evidence regarding exercise in pregnancy. I will also address the risks and benefits of the aquatic sports in pregnancy. These guidelines will provide female athletes with advice based on fact, and not on folklore.

How does the body change in pregnancy?

Reviewing the physical changes that occur during pregnancy is essential in understanding the exercise recommendations. There are many physical adaptations that occur naturally in the pregnant female that affect a woman's ability to exercise.

Musculoskeletal adaptations:

- The increase in weight causes increased forces or stress through the hips and knees.
- The enlarged abdomen may cause strain on the lumbar area (lower back).
- Balance may be affected by postural changes from the enlarged abdomen.
- Ligaments are loser or lax due to the effect of the natural hormone called relaxin.

Cardiovascular adaptations:

- There is an increase in blood volume, heart rate and heart function (cardiac output).
- There is a drop in blood pressure in the second trimester (months 4-6).
- There is a blunted response of the heart rate in pregnancy to exercise.
- When the pregnant woman is lying on her back, the weight of the pregnant uterus may compress and occlude the large vein returning blood to the heart (Inferior vena cava) causing fainting after the 4th month.

Respiratory adaptations:

- There is an increase in breathing rate in pregnancy.
- There is an increase in oxygen uptake and oxygen consumption.
- Deep breathing is inhibited at the end of pregnancy as the diaphragm is pushed up by the large uterus.

Metabolism adaptations:

- The basal metabolic rate (heat production) is increased.
- Fatigue is a normal phenomenon in pregnancy especially during the first and last 3 months.

What are the exercise recommendations?

Frequency:

According to the Canadian Academy of Sports Medicine, 30 minutes of moderate intensity exercise is recommended for 3-5 times minimum per week. A gradual increase in duration and frequency is recommended only after the first trimester (months 1-3). If an athlete is already training more than this, she can continue her current regimen in the absence of any complications and providing that she not increase her training during the first three months.

Monitoring Intensity:

As the heart rate does not respond in pregnancy to exercise the same as in non-pregnancy, it is important that the pregnant athlete does not to rely on heart rate as a measure of exercise intensity. It is better for the athlete

to strive to exercise to a perceived level of moderate exertion. She should be able to talk at all times. Breath holding should be avoided.

Aerobic exercise:
Aerobic exercise is recommended to maintain fitness during pregnancy. It is important to avoid exercise that increases risks of falling due to the changes in balance that occur in pregnancy. There should be a good warm up and cool down.

Resistance training:
Weight lifting is also safe in pregnancy providing that the pregnant athlete does not exercise in the supine or lying down position after the fourth month. As described above, this can cause fainting due to occlusion of the large abdominal vein by the pregnant uterus. The resistance or weight should be lowered, and the repetitions should be increased. Breath holding should be avoided.

Flexibility:
Due to the effects of the hormone relaxin on the ligaments, gentle stretching is recommended to avoid injury.

Nutritional Recommendations:
After the 13th week of pregnancy, the pregnant athlete should increase her caloric intake by approximately 300kcal per day. A further increase may be necessary depending on the amount of energy expended in exercise. Adequate water intake before, during and after exercise is essential in the pregnant athlete.

Of course, the general nutritional recommendations in pregnancy also apply to the pregnant athlete as well. These include an increase of calcium and an adequate intake of folic acid (leafy green vegetables).

Exercise in the Non-athlete:
Non-athletes should not begin exercise during the first trimester (months 1-3). It is safer to start an exercise program during the second trimester (months 4-6).

Are there sports that pregnant athletes should avoid?

According to the Australian Institute of Sport, there are a number of sports that should be avoided in pregnancy. These include:

- Scuba diving
- Parachuting
- Waterskiing
- Martial arts
- Gymnastics
- Trampoline
- Horseback riding

It is essential to remember to avoid exercising in the supine or recumbent position. Contact sports should be avoided due to the risk of direct trauma to the abdomen. As well, any sport where falling is a risk should be avoided. Scuba diving is very dangerous in pregnancy as the fetus is particularly vulnerable to decompression sickness.

Is it safe for all pregnant athletes to exercise?

The American College of Obstetrics & Gynecology has developed two lists of complications that preclude a pregnant woman from exercising. The first list contains "absolute contraindications" to aerobic exercise curing pregnancy. If a pregnant athlete has any of these complications she must not exercise under any circumstances. It is important that all pregnant athletes consult a physician to rule out the presence of any of these complications prior to exercising.

Absolute contraindications for exercise in pregnancy
Cardiovascular disease
Restrictive lung disease
Multiple gestations
Vaginal Bleeding
Incompetent Cervix (repetitive miscarriages)
Premature labour
Rupture of amniotic membranes
Pregnancy induced hypertension (bp)
Placenta previa (abnormal placement of placenta)

The second list contains the "relative contraindications" to aerobic exercise in pregnancy. Exercise may occur in these situations, but only under close medical supervision. Again, a medical doctor must be consulted to evaluate and monitor all pregnancies to detect and treat any of these complications.

Relative contraindications for exercise in pregnancy
Severe anemia (low hemoglobin)
Poorly controlled Diabetes
Extreme obesity
Extreme underweight
IUGR (Intra-uterine growth retardation)
Chronic Bronchitis
Poorly controlled hypertension
Poorly controlled seizure disorder
Heavy smoker
Poorly controlled thyroid disease
Orthopedic limitations

When should the pregnant athlete stop exercising?

It is important that all pregnant athletes be aware of the warning signs of complications that could be affected by exercise. Educating the pregnant woman to watch for these complications is essential! If any of these situations were to occur, the athlete should stop exercising and seek medical attention for evaluation.

The following is a list of the warning signs:

- Vaginal bleeding
- Shortness of breath
- Headache
- Dizziness
- Calf swelling & pain
- Chest pain
- Premature labour
- Amniotic fluid leakage
- Decreased fetal movements
- Insufficient weight gain

One of the most important situations when the athlete should stop exercising is in conditions of extreme heat. Increases of more than 1.5 degrees of maternal core temperature during the first three months of pregnancy can cause serious malformations to the brain and spinal cord of the fetus. For this reason, hot tubs, saunas and exercising in hot environments are to be avoided. Resting frequently and adequate water intake during exercise are essential in preventing this tragic, avoidable phenomenon.

What kind of medical monitoring should the pregnant athlete have?

Prior to exercise, the pregnant athlete should seek medical advice from a qualified physician. The absolute and relative contraindications listed above must be ruled out. The risks of exercise should be reviewed, and appropriate modifications to training implemented.

Ongoing monitoring during pregnancy is also recommended at regular intervals. Each visit should evaluate the fetal heart rate and growth. Blood pressure and weight gain should be monitored. Dietary modifications should be reviewed, and any complications of pregnancy should be identified and treated.

It is important that the pregnant athlete have a medical doctor that is aware of the scientific research concerning pregnancy in exercise.

What are the benefits of exercising in pregnancy?

The benefits of exercise are well known to any athlete! There are added benefits in pregnancy. It was once believed that exercise during pregnancy would be dangerous for the pregnant woman and for the unborn child. This in fact is not true! Exercise in pregnancy promotes better health for the pregnant woman, a reduction in delivery complications and an improved recovery after delivery.

The Canadian Academy of Sports Medicine outlines the following benefits of exercise in pregnancy:

Benefits of exercise in pregnancy

Reduction in the risk of diabetes & cardiovascular disease
Reduction in the incidence of obesity
Reduction of osteoporosis
Reduction of some cancers
Better general health
Improvement of self esteem
Improvement in strength, balance, endurance & fitness
Health care cost savings
Improved sense of well being
Reduction in the symptoms of pregnancy
Decrease in complications during labour
Reduced recuperation time from labour

It is obvious from the above list that the benefits of exercise in pregnancy in a healthy woman are numerous, with minimum risk!

What about the safety of aquatic sports in pregnancy?

Scientific research has been conducted on swimming in pregnancy. Exercising in water has many advantages over exercising on land. The aquatic environment is perfect for maintaining a normal temperature, thereby decreasing the risk of hyperthermia and subsequent fetal developmental problems as described above. Exercising in water also minimizes the risk of joint injuries as the water assists in dissipating the increased gravitational forces through the joints. As there is a shift in blood volume in the water, there is a significant reduction in edema or swelling in the lower legs which some women find troublesome during pregnancy. Most importantly, the research shows that there are no adverse effects of swimming on the fetus.

There has been no specific scientific research on exercise during pregnancy in the other aquatic disciplines. Taking into consideration the physiological changes in the pregnant athlete's body and the general guidelines regarding exercise in pregnancy, certain recommendations can be made. Caution should be used when playing water polo as it carries a high risk of trauma to the

abdomen. Diving is also not an ideal sport while pregnant due to the altered balance, and risk of trauma. Synchronized swimming has many features that make it a risky form of exercise in pregnancy. For example, complex lifts and boosts should be avoided as this increases the risk of trauma to the abdomen. As a pregnant woman's balance is altered in pregnancy, the ability to maintain a vertical is difficult. Most importantly, prolonged breath holding is not recommended in pregnancy!

What about the pregnant athlete who wishes to remain competitive?

The pregnant competitive swimmer will encounter the same limitations and physiological changes that the recreational athlete faces. These women require closer medical monitoring. According to the American College of Sports Medicine, most pregnant competitive athletes do maintain a higher level of exercise throughout pregnancy and resume a high intensity level of training faster after delivery.

There are a number of factors that limit the ability of the competitive athlete. Weight gain, laxity of joints and ligaments, and change in balance inhibit the pregnant athlete's performance. Due to the anemia in pregnancy from the increased blood volume, long distance swimming is challenged. It is found that the infants of elite athletes tend to have lower birth weights.

Particular attention to heat complications is necessary in high intensity training. Adequate hydration is essential.

Summary

The scientific evidence shows that exercise in pregnancy carries a low risk to both the woman and the fetus. It is also clear that exercise in pregnancy has many important and significant benefits. In particular, swimming is one of the safest and most comfortable forms of exercise that a pregnant athlete can practice. For this reason, I encourage my non-aquatic athletes to cross train during their pregnancy by swimming.

The guidelines for exercising in pregnancy described above can be utilized by athletes, coaches, trainers and physicians. I encourage and challenge all women to maintain their fitness and well-being during pregnancy by exercising in the water!

For further information, you can access the following references on the World Wide Web:

Australian Sports Commission: www.ausport.gov.au
Canadian Academy of Sports Medicine: www.casm-acsm.org
Guidelines of the American College of Obstetricians and Gynecologists: www.bjsm.bmjjournals.com

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I am also keen to hear your suggestions and requests for topics for future articles. Your FINA Sports Medicine Committee is here to help you and your athletes keep healthy and injury-free!