Recommendations on Physical Activity During Pregnancy of Women with Gestational and Pregestational Diabetes

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1. Physical Activity and Pregnancy

Physical activity during pregnancy has many positive effects on the mother as it reduces the risk of excessive weight gain, gestational diabetes, preeclampsia, premature birth, varicose veins and deep vein thrombosis, and lower back pain (1). It also reduces the duration of labor and complications at childbirth, fatigue, stress, anxiety and depression, leading to an improved sense of wellbeing. The potential benefits for the fetus can be summarized as follows: improvement of placental function with increased amniotic fluid, flow and volume of the placenta, fetal vascular function, placental villous tissue and speed growth, neuronal development and reduced percentage of fetal fat (2).
All women should know how to safely exercise during pregnancy and in the postpartum period.
Providing a woman with an adequate prescription of physical exercise can encourage her to take part in safe and effective activities throughout her pregnancy, in the absence of contraindications. (Table 1).

Below it is possible to read the recommendations offered by the SOGC Clinical Practice Obstetrics Committee, the Executive and Council of SOGC, and the Board of Directors of the Canadian Society for Exercise Physiology2 and ACOG (3).

1. Starting a physical activity program should be considered during the preconception phase, particularly by women who are overweight-obese and/or with other risk factors for gestational diabetes (previous gestational diabetes, first-trimester fasting hyperglycemia, prior macrosomia, above 35 years of age, positive familiarity for diabetes, PCOS, high-risk ethnicity) in order to avoid excessive weight gain during pregnancy and prevent diabetes. (Level III, Strength B)

2.During pregnancy, all women without contraindications should be encouraged to do aerobic and strength exercises as part of a healthy lifestyle. (Level II, Strength B)

3.Women who are already physically active before pregnancy can maintain a satisfactory exercise level, without competitive activities, throughout their pregnancy, if the pregnancy does not show complications and the activity complies with safety criteria such as type,

intensity and frequency, without trying to reach peak fitness or train for an athletic competition. (Level II, Strength C)

4.It is necessary to choose activities that minimize the risk of balance loss or fetal trauma. (Level III, Strength C)

5.Women should be advised that physical activity does not increase the risk of maternal or fetal complications. (Level II, Strength B)

6.Performing pelvic floor exercises in the postpartum period can reduce the risk of future urinary incontinence.
(Level II, Strength C)

7.Women should be advised that moderate physical exercise during lactation does not affect quality and quantity of breast milk or infant growth. (Level I, Strength A)

1.2 Functional Adaptation during Pregnancy

Musculoskeletal adaptations

The physiological anatomical changes occurring during pregnancy may affect the musculoskeletal system both at rest and during exercise (4). The most obvious change is weight gain, which can intensify pressure on all the joints, especially the knees, causing discomfort for normal joints and damage increase in those previously unstable. It should be noted that weight gain and abdominal volume increase could cause lumbar lordosis and posture changes, putting women at risk of balance loss and falls. Finally, during gestation, it is observed an increased ligament laxity due to increased levels of estrogens and relaxin, which may predispose women to a higher risk of tearing and sprain. Although there is no evidence of an increased musculoskeletal injury during pregnancy, this possibility must be considered when prescribing physical exercise.

Cardiovascular adaptations

Pregnancy leads to important cardiovascular changes: increased blood volume, heart rate and stroke volume, and decreased systemic vascular resistance (5,6). During the mid-trimester, the cardiac output increases by 30-50% compared to the non-gestational state (7). Most studies show that blood volume increases by 10% by the end of the first quarter, while heart rate increases by 20% during the second e third quarter (8).
Mean blood pressure decreases by 5-10 mmHg by the middle of the second quarter and then gradually increases again returning to pregestational levels. The decrease in mean arterial pressure is due to an increase in uterus vascularization, uterine-placental circulation, and a decrease of vascular resistance mainly cutaneous and renal (9). Moreover, after the first trimester, the supine position determines a related obstruction of venous return with reduced cardiac output, and it should therefore be avoided as much as possible both during rest and physical exercise. The orthostatic position without movement should be avoided as well, as it can lead to a significant decrease in cardiac output (10).
These hemodynamic changes aim at obtaining a useful circulatory reserve to provide nutrients and oxygen to both mother and fetus, at rest and during a moderate (but not intense) physical activity.

Respiratory adaptations

Pregnancy is associated with significant respiratory changes: 50% increase in ventilation and arterial oxygen tension, especially in the first quarter, rise in the oxygen uptake and its consumption baseline. During pregnancy, the availability of oxygen necessary to perform aerobic exercise decreases due to a larger oxygen requirement at rest, and an increased breathing, which is caused by the pressure on the diaphragm due to uterine enlargement.

Thermoregulation

During pregnancy, the basal metabolism and the heat production are increased (11). The fetal temperature is usually 1° C higher than the maternal one. The excess heat dissipation generated during physical exercise can pose a problem, given that some studies suggest that hyperthermia (body temperature > 39° C) during the first 45-60 days of gestation may be teratogenic in humans. During exercise, the body temperature increase is directly related to the exercise intensity itself, rising by an average of 1.5° C during the first 30 minutes. If the exercise is prolonged for another 30 minutes, then the body temperature reaches a plateau. A constant ratio between production and heat dissipation is usually guaranteed by an increase in heat conductance from the center to the periphery, through the cardiovascular system, and cooling through sweating. However, if the heat production exceeds the capacity of dissipation, for example during exercise in warm, humid conditions or a very high-intensity exercise is being performed, the temperature may further rise. Physical exercise should be preferably performed in a thermoneutral environment or under controlled conditions (such as air conditioning). (Level VI, Strength C)

Furthermore, proper hydration must be maintained, since the fluid loss through sweating can affect heat dissipation during prolonged exercise.

In the following section, we review the literature and make concrete suggestions regarding areas of prevention of gestational diabetes mellitus (GDM) in the general female population, treatment and/or prevention of GDM in gestation and prescription of exercise in pregnancy, with specific attention to type, intensity and volume.

2. Physical Activity in Gestational Diabetes

2. 1 Prevention

Regular exercise before pregnancy has been associated with a reduced risk of developing GDM (12,13). Cycling exercise initiated early in pregnancy and performed at least 30 minutes, 3 times per week, is associated with a significant reduction in the frequency of gestational diabetes mellitus in overweight/obese pregnant women strongly related to less gestational weight gain before the mid-second trimester (14). Even the physical activity performed in a woman's spare time before pregnancy may reduce her risk of developing gestational diabetes (15, 16).

Being physically active during pregnancy may prevent GDM and delay the onset of type 2 diabetes (17). Women who regularly perform physical activity in the year before their pregnancy have a decreased risk, which is reduced to 50% if the exercise is carried out during the first 20 weeks of pregnancy as well18. Furthermore, a recent study reported that associating aerobic and strength exercise three times a week for 30 minutes throughout the pregnancy is safe and leads to a reduction of GDM incidence (19). Despite the positive evidence, not all studies concluded that physical activity can prevent the appearance of GDM (20). Recent trials (RCTs) have assessed the role of a prescribed healthy lifestyle on the prevention of GDM in women at high risk (obese women with a history of previous GDM) (Table 2).

The "UPBEAT" study (21), which aimed at assessing the role of lifestyle (physical activity + healthy eating) in obese and multi-ethnic English women, whose 3-10% with previous gestational diabetes, while noticing a weight and body fat reduction, it did not demonstrate any difference in the prevalence of GDM (intervention group vs. standard group 26% vs. 25%) and macrosomia.
Also, the "LIMIT Study" (22), an Australian RCT study of 2,212 overweight or obese women (1,104 with standard treatment and 1,108 with diet + lifestyle), did not demonstrate any differences in maternal outcomes (gestational diabetes, hypertension and preeclampsia) and neonatal (large for gestational age and macrosomia), while the study LIMIT2 showed a reduction of new-borns whose weight was above 4.5 kg.
The “DALI” pilot study (23), a European multicenter trial, involving 150 pregnant women BM > 29 kg/m2, did not show any significant difference in the three treatments which included a change of lifestyle (physical activity or healthy eating or both). It was observed only a lower weight gain and lower fasting blood sugar in the diet-only group compared to the group treated with physical activity alone. The combination of both interventions did not show any superiority in terms of outcomes.
The "RADIEL" study (24), a Finnish RCT, assessed the efficacy of an intervention combining diet and physical activity during pregnancy in 293 women with high risk (BMI <30 kg/ m^2 or previous gestational diabetes), recruited before their 20th week of gestation. Women in the intervention group showed a lower prevalence of GDM (13.9% vs. 21.6% of the control group), reducing the risk by 39%. There was also an increase in physical activity in the spare time, better nutrition and a lower weight gain (-0.58 kg).
A chinese randomized clinical trial (14), recruited 300 overweight/obese women at 10 weeks’ gestational age. They were randomized into an exercise group or a control group, the exercise group engaged in a supervised cycling program involving at least 3 sessions per week. Women randomized to the exercise group had a significantly lower incidence of gestational diabetes mellitus (22.0% vs 40.6%; P <.001).This represents a clinically important 45.8% reduction in the incidence of GDM. These women also had significantly less gestational weight gain by 25 gestational weeks and at the end of pregnancy and reduced insulin resistance levels at 25 gestational weeks.

Tab. 2 RCTs on prevention of GDM

Clinical Trials	Country	n. Patients	GDM Incidence Reduction
UPBEAT (21)	England	1555	none
LIMIT (22)	Australia	2212	none
RADIEL (24)	Finland	269	39%
DALI (23)	Europe	150	none
Chine(14)	Chine	300	45.8%

Results from 13 RCTs (of a low quality) do not show clear differences in the risk of developing gestational diabetes in women who received a combination of diet and exercise intervention, compared to women who did not receive it. The inability to draw definitive conclusions in these women, is likely to depend on the individual characteristics of the interventions, differences among the studied populations with diverse pathogenesis of gestational diabetes and in the objectives of the different trials (25).
Further studies are required to assess the relationship between lifestyle change, weight gain during pregnancy and GDM incidence, evaluating data on women with varying degrees of insulin resistance and on women with reduced insulin secretory capacity.

2. 2 Treatment

Physical exercise is highly recommended to the broad population before and during pregnancy, and to women suffering from gestational diabetes and to populations at risk for GDM (26).
Both aerobic and strength exercise can determine higher insulin sensitivity (27), increased glucose uptake (28), smaller weight gain (29), delayed start of insulin therapy, reduced amount of administered insulin (30), and it also improves cardio-respiratory fitness (Level III B) in women with GDM. However, any kind of physical activity is not always sufficient to ensure a proper metabolic control; thus, it is necessary to use insulin therapy to manage maternal hyperglycemia (31). One of the intervention studies (RCT) (32) has shown that regular physical activity during pregnancy can improve other outcomes, such as 58% risk reduction of having an infant with macrosomia and 34% risk reduction of having a preterm delivery (Level I, Strength A).
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2. 3 Exercise Training Prescription

At the beginning, we can encourage women to become more physically active by performing unstructured physical activity into daily living before and during gestation (33). This would be considered as a fitness starting point from which to progress towards the prescription of physical exercise, if there are no other contraindications (table 3)

The prescription should take into account type, intensity, frequency, duration and progression as shown in the tables 4 and 5 adapted from Colberg (34)

Type of exercise
The majority of pregnant women with and without GDM can safely perform aerobic exercises of moderate/vigorous intensity.
These include, such as walking, running, dancing, strength machines and weightless body activities, such as cycling, different aquatic activities, exercises on the chair, hand-crank ergometer 35. The strength work is safe and effective when adapting the insulin (where necessary) and checking the hyperglycemia (36,37); weightlifting equipment exercises using progressive resistance elastic bands for arms, legs, abdomen and back (Table 6). The exercise must be tailored to each woman's physical condition with mild to moderate intensity.
The most recent guidelines suggest adding a slight strength activity to routine physical activity (38).
Activities with high risk of falling (horse riding, downhill skiing, etc.) or abdominal trauma should be discouraged.
Sports with high potential for physical contact (such as ice hockey, football and basketball) can cause severe trauma to both mother and fetus and should therefore be discouraged.
Diving should be avoided during pregnancy, because the fetus is at risk of decompression sickness. Caution should be observed in practicing physical exercise at high altitude (>2500 m). (Level VI, Strength C)

Intensity
Healthy women, who are already physically active during pregnancy and postpartum, are recommended to continue with a moderate-intensity aerobic activity (3-6 Mets, 40-50% Heart Rate Reserve (HRR) 4-6 of Borg CR10 Scale, Talk Test) (table 7,8) (39). A woman who is not physically active before pregnancy can start with 30% (HRR) and progress to a moderate level (Table 4). Using a heart rate monitor is helpful to control this variable.

The "Talk test" is a simple system, alternative or complementary to the previous tests used to evaluate the adequacy of exercise intensity. If a woman is able to maintain a conversation while exercising, the intensity of the physical activity is adequate. Intensity should be reduced whenever the conversation is not possible.
(Level VI, Strength C)
The Borg scale is used to assess the INTENSITY of different training sessions, it represents the SUBJECTIVE assessment INDEX and perception of FATIGUE (40).

Frequency

Existing guidelines, encourage physical activity throughout gestation, involving both aerobic and strength work (41) during most, if not all, days; this also applies to women with GDM (42). A daily physical exercise improves glucose metabolism. The increased muscular sensitivity, due to the insulin, lasts for about 24 hours after exercising. It is, therefore, suggested that the recommended frequency for any kind of physical activity in women suffering from GDM is from three to seven days a week (43).

Duration

Pregnant women without medical and/or obstetrical complications should allocate at least 150 minutes per week to physical activities (44). Aerobic exercise should last for a minimum of 15 minutes per session, 3 times a week, and it should be gradually increased during the second quarter up to about 30 minutes per session, 4 times a week. (Level VI, Strength C)
Aerobic activity should be preceded by a short warm-up (10-15 min) and followed by a short cool down phase (10-15 min), including stretching and relaxation exercises (Level VI, Strength C).

Progression

Sedentary women with GDM or non-insulin-treated type 2 diabetes should begin with low intensity (30%-39% HRR) and gradually progress to moderate intensity (40%-59% HRR), if there are no obstetrical contraindications. At the beginning, it is recommended to increase activity frequency and duration rather than its intensity. Women, who were active before and during pregnancy, should continue to engage in moderate to vigorous intensity (45) after being diagnosed with GDM, if there are no obstetrical contraindications.
It is advised to continue physical exercises in the postpartum period. Physical activity increases cardio-respiratory fitness and improves mood without any negative effects on maternal milk volume and composition (46) (Level I, Strength A).
Soon afterdelivery, pelvic floor exercises can reduce the risk of future urinary incontinence (Level I, Strength C). Continuing physical activity after the pregnancy helps women in achieving and maintaining ideal weight, when combined with caloric restriction. (Level I, Strength A)
This strategy can prevent and/or delay diabetes onset in women who previously suffered from gestational diabetes. (Level I, Strength B) (47,48).

2.4 Conclusions

Despite some positive evidence, many studies did not conclude that physical activity can prevent the appearance of GDM (49). Certainly, high-risk women can improve pregnancy outcomes by changing their lifestyle before and during pregnancy. In those who develop GDM, a correct lifestyle and regular physical activity are often sufficient to handle hyperglycemia, even without insulin therapy contain weight gain and preent pre-eclampsia (22). Providing a pregnant woman with an adequate prescription of physical exercise can

encourage her to take part in safe and effective activities throughout her pregnancy. It is stressed that being physically active improves general health.

3. Type 1 Diabetes

The benefits of physical activity are the same for people suffering from type 1 diabetes as well as for non-diabetic people, in the absence of contraindications (Table 9) (50,51, 52,53) (Level III, Strength B).

Tab 9 Contraindications to physical activity in type 1 diabetes

Diabetic complications	Controindicated Sports
Proliferative retinopathy	Sports with heavy work and power: weightlifting, throwing.
Severe nephropathy	Intense physical activity, need strict blood pressure control
Peripheral neuropathy	Running, jogging
Autonomic neuropathy	exercise restrictions for hypotension risk and high cardiovascular risk

Physical exercise and diet in patients with type 1 diabetes can help improve metabolic control during pregnancy. (Level V, Strength B)
The programme must consider type, duration, frequency, intensity, timing, and algorithm of physical exercise, similarly to GDM. Physical exercise produces long-term effects on the metabolism of glucose, lipids and proteins.
The lack of physiological inhibition of insulin secretion in patients with type 1 diabetes is responsible for increased risk of hypoglycemia during exercise. Moreover, exercise induces the activation of anti-regulatory hormones that might trigger an acute metabolic disorder in individuals with severe insulin deficiency. Basal insulinisation status alters the effects that physical exercise has on blood sugar. For these reasons, in type 1 diabetes, physical activity requires:

- Thorough training about the effects that physical activity causes on glycemic levels
- Knowing what kind of adjustments should be made (food and insulin therapy) subordinated to recorded blood glucose before exercise, type and timing of insulin therapy, duration and intensity of exercise.

The complexity of these factors explains the difficulty to define guidelines applicable to all diabetics, particularly to pregnant women with type 1 diabetes. Diabetologists should satisfactorily follow and advise their patients, given their extensive knowledge about the subject. The exercise intensity modulates effects on blood glucose: marked activation of the sympathetic nervous system causes hyperglycemia after strenuous exercise. Sub-maximal (70-85% VO2max) or moderate (50-70% VO2max) physical activity in the presence of adequate insulinisation lowers blood glucose with an effect dependent on duration and intensity. It is well known that a single session of exercise increases insulin peripheral sensitivity, however, this withdraws within 24-36 hours. If the sessions are followed regularly, these will result in a stability of decreased insulin sensitivity with lower glucose swings, as the insulin dose adjustment can be fixed, and they are not episodic in relation to a single exercise session.
Insulin therapy during exercise in pregnancy should ensure:

- The possibility to simulate the physiological response to exercise as much as possible

• The possibility to reduce basal insulin during aerobic exercise with a moderate or sub-maximal intensity

Monitoring glycemic during physical activity in patients with insulin-dependent diabetes and notably in gestational diabetes before a pregnancy is very useful to perform physical activity safely, aimed at maintaining blood glucose around 120 mg/dl (54,55) (Level II, Strength A).

Blood glucose responses to physical activity in all people with type 1 diabetes are highly variable based on activity type/ timing and require different adjustments. Before carrying out a physical activity session, it is necessary to assess exercise timing and duration, blood glucose and ketones levels (56):

- The exercise duration in relation to the last insulin injection: the optimal time to begin an exercise session is 2 hours after a fast-acting administration or 8-10 hours after a long-acting administration.

- During aerobic exercise, muscles use glucose, which causes an immediate need to release glucose from the liver. If the insulin dose has not been reduced before physical exercise, the insulin concentration will be relatively high and the glucose hepatic production inhibited.

- Blood glucose concentrations should always be checked prior to exercise. Table 10 suggested carbohydrate intake or other actions based on blood glucose levels at the start of exercise in T1DM pregnancies (56,57,58)

Table 10.

Pre-exercise blood glucose	**Carbohydrate intake or other action**
<90 mg/dL (<5.0 mmol/L)	Ingest 15–30 g of fast-acting carbohydrate prior to the start of exercise, depending on the size of the individual and intended activity; some activities that are brief in duration (<30 min) or at a very high intensity (weight training, interval training, etc.) may not require any additional carbohydrate intake. For prolonged activities at a moderate intensity, consume additional carbohydrate, as needed (0.5–1.0 g/kg body mass per h of exercise), based on blood glucose testing results.
90–150 mg/dL (5.0–8.3 mmol/L)	Start consuming carbohydrate at the onset of most exercise (~0.5–1.0 g/kg body mass per h of exercise), depending on the type of exercise and the amount of active insulin.

Pre-exercise blood glucose	Carbohydrate intake or other action
150–250 mg/dL (8.3–13.9 mmol/L)	Initiate exercise and delay consumption of carbohydrate until blood glucose levels are <150 mg/dL (<8.3 mmol/L).
250–350 mg/dL (13.9–19.4 mmol/L)	Test for ketones. Do not perform any exercise if moderate-to-large amounts of ketones are present. Initiate mild-to-moderate intensity exercise. Intense exercise should be delayed until glucose levels are <250 mg/dL because intense exercise may exaggerate the hyperglycemia.
≥350 mg/dL (≥19.4 mmol/L)	Test for ketones. Do not perform any exercise if moderate-to-large amounts of ketones are present. If ketones are negative (or trace), consider conservative insulin correction (e.g., 50% correction) before exercise, depending on active insulin status. Initiate mild-to-moderate exercise and avoid intense exercise until glucose levels decrease.

Adapted from Physical Activity/Exercise and Diabetes: A Position Statement of the American Diabetes Association

If the patient has taken a heavy carbohydrate load, it is advised to correct blood glucose according to their insulin sensitivity and carbohydrate to insulin ratios, prevent dehydration by drinking liquids and check the blood glucose trend after 15 minutes.

After the session, it is necessary:
To learn more about the early and late glycemic response to exercise, by checking blood glucose at the end of the session and in the following hours until the next morning.
This allows:

1. To schedule the following exercise sessions according to duration and intensity, and to reduce insulin therapy in response to physical activity.
2. To tailor the adjustments of insulin therapy and CHO intake in relation to these variables.

Taken the variables related to insulin therapy above mentioned into account, please refer to the algorithm described for the GDM for exercise prescription during pregnancy in women with type 1 diabetes.

4. Type 2 Diabetes

Please refer to the algorithm described for the GDM for exercise prescription during pregnancy in women with type 2 diabetes.
If the patient needs insulin therapy, it is appropriate to take into account the same reccomendations of type1 diabetic pregnant women even though the resposes are likely to be different.

4. RECOMMENDATIONS

Exercise aimed at preventing and/or treating of gestational diabetes

- Physical exercise improves insulin sensitivity and reduces plasma levels of glucose through several insulin-mediated and non-insulin-mediated mechanisms. It has positive, long-term effects on insulin resistance increasing lean body mass. (Level I, Strength A)
- The combined intervention of exercise and diet in gestational diabetes limits the maternal weight gain and fetal overgrowth. (Level I, Strength B)
- Life style prevents gestational diabetes in obese women belonging to certain ethnicites or genetic characteristics (Level I, Strength A).
- Aerobic and strength exercise can determine delayed start of insulin therapy, reduced insulin need, and better cardio-respiratory fitness. (Level III, Strength B)
- Regular physical activity reduces the risk of macrosomia to 58% and preterm delivery to 34% (before the 37th week of pregnancy). (Level I, Strength A) Encouraging women to do more exercise throughout their day, before and during pregnancy, is a precondition for a personalised exercise prescription in the absence of contraindications (Level I, Strength A).

Physical exercise in pregestational diabetes

- Physical exercise during pregnancy is useful in diabetic women as well as in non-diabetic women. (Level III, Strength B)
- Continuous monitoring of blood glucose to check blood glucose in type 1 diabetic patients during exercise is a valuable instrument. (Level II, Strength A)
- Physical exercise and diet in patients with diabetes can help improve metabolic control during pregnancy (Level V, Strength B).
- Physical exercise is contraindicated in diabetic women if are present severe desaes's complications (Level I, Strength A).

Postpartum physical exercise

- Physical activity increases cardio-respiratory fitness and improves mood without having any negative effects on maternal milk volume and composition. (Level I, Strength A)
- In the immediate postpartum period, pelvic floor exercises can reduce the risk of future urinary incontinence. (Level I, Strength C)

- Physical activity helps women achieve and maintain weight after childbirth, and it promotes weight loss when combined with an adequate caloric restriction. (Level I, Strength A)
- Physical activity combined with a proper nutrition can prevent and/or delay diabetes onset in women who previously suffered from gestational diabetes. (Level I,Strength B)

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Tab. 1 Contraindications to aerobic exercise during pregnancy; adapted from ACOG 2015(3)

Absolute	Relative
Hemodynamically significant heart disease	Anemia
• Restrictive lung disease	• Unevaluated maternal cardiac arrhythmia
• Incompetent cervix or cerclage	• Chronic bronchitis
• Multiple gestation at risk of premature labor	• Poorly controlled type 1 diabetes
• Persistent second- or third-trimester bleeding	• Extreme morbid obesity
• Placenta previa after 26 weeks of gestation	• Extreme underweight (BMI less than 12)
• Premature labor during the current pregnancy	• History of extremely sedentary lifestyle
• Ruptured membranes	• Intrauterine growth restriction in current pregnancy
• Preeclampsia or pregnancy-induced hypertension	• Poorly controlled hypertension
	• Orthopedic limitations
	• Poorly controlled seizure disorder
	• Poorly controlled hyperthyroidism
	• Heavy smoker
Warning signs to terminate exercise while pregnant	
Vaginal bleeding	Dyspnoea before exertion
Dizziness	Headache
Chest pain	Muscle weakness
Calf pain or swelling (need to rule out thrombophlebitis)	Preterm labour
Decreased fetal movement	Amniotic fluid leakage

Table 3

<table>
<tr>
<td rowspan="2">Physical Activity
simply means movement of the body that uses energy

NON CONDITIONING

OCCUPATIONAL
go to work

COMMUTING
walking
shopping
Climbing the stairs
Gardening
briskly pushing a baby stroller</td>
<td colspan="2">Free Time Physical Activity
FTPA

CONDITIONING</td>
</tr>
<tr>
<td>No Structured

Jogging
Bicycling
Water aerobic
Dancing
Running
Swimming
Weights</td>
<td>Structured Planned

Repetitive bodily movements as a final or an intermediate objective the improvement or maintenance physical fitness.

Exercise</td>
</tr>
</table>

Tab. 4 Example using heart rate reserve to determine target hazard ratio range	
Target HR range (40%-89% Heart Rate Reserve HRR)	Example patient: 30-year-old female Resting HR: 78 beats per minute (bpm) Maximum HR: 190 bpm (estimated as 220 minus age)
Formula for sample calculation: Target HR = [(Max HR-Resting HR) × Desired Intensity] + Resting HR	
Low end of moderate intensity 40% = [(190-78)x0,40]+78 = 45 + 78 = F.C.123 bpm	
High end of vigorous intensity 89% = [(190-78)x0,89]+78 = 100 + 78 = F.C 178 bpm	
Target HR range (40%-89% HRR) = 123 to 178 bpm	

Adapted from Colberg SR - Exercise and Diabetes: A Clinician's Guide to Prescribing Physical Activity, American Diabetes Association

Tab.5 Recommended exercise prescription for women with gestational diabetes	
Mode*	Aerobic: Walk, stationary cycle, swim, aquatic activities, conditioning machines, prenatal exercise classes, prenatal yoga, seated exercises, and possibly jogging or running (if highly active before pregnancy)
	Resistance: Light or moderate resistance exercises
*Exercises to Avoid: Activities lying flat on the back and any that increase the risk of falling or abdominal trauma (*e.g.*, contact or collision sports, horseback riding, downhill skiing, water skiing, soccer, outdoor cycling, basketball,most racquet sports, and scuba diving)	
Intensity	If inactive: moderate-intensity aerobic activity (40%-59% HRR, or "somewhat hard") during pregnancy and postpartum
	If already active or doing vigorous activity: moderate- to vigorous intensity activity (40%-89% HRR, or "somewhathard" to "hard")
Frequency	3-7 d, spread throughout the week Better done on most, if not all, days of the week
Duration	30 min/session (range of 20-45 min) At least 150 min of moderate-intensity physical activity spread throughout the week
Progression	If just starting, increase duration of moderate exercise slowly; if already more active, maintain or lower intensity during pregnancy rather than attempting to progress to higher levels

Adapted from Colberg SR - Exercise and Diabetes: A Clinician's Guide to Prescribing Physical Activity, American Diabetes Association

Tab.6 Examples of muscle-strengthening exercises

Category	Purpose	Example
Upper back	To promote proper posture	Raising your shoulders, Tighten your shoulder blades
Lower back	To promote proper posture	Standing, raise leg and opposite arm
Abdomen	To promote proper posture, prevent back pain, prevent diastasis rectus abdominis muscles, strengthen the muscles involved in labor	Abdominal Strengthening, abdomen rotation; stretching upward and lateral stretching of the neck muscles
Pelvic Floor	To foster a good bladder control, to prevent urinary incontinence	Swaying, staying on her toes
Highest part of the body	To improve muscular support for breastfeeding	Shoulders rotation, push towards a wall and lift with arms
Glutes and legs	To sustain weight increase and prevent varicose veins	Tighten your glutes while standing leg lift, raise heels

Table 7

METs express the energy cost of physical activities as a multiple of the resting metabolic rate.

The **Metabolic Equivalent of Task (MET)**,or simply **metabolic equivalent**, is defined as the amount of oxygen consumed while sitting at rest and is equal to 3.5 ml O2 per kg body weight x min.

Table 8

The Borg scale is used to assess the INTENSITY 'of the various training sessions, it is the INDEX SUBJECTIVE of fag evaluation and perception.

Perceived	Description
0	Nothing at all
0.5	Extremely weak
1	Very weak
2	Weak (light)
3	Moderate
4	Somewhat Strong
5	Strong (Heavy)
6	
7	Very Strong
8	
9	
10	Extremely Strong
*	Maximal