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Obesity in Pregnancy

This Clinical Practice Guideline has been prepared by the Maternal Fetal Medicine Committee, reviewed by the Clinical Practice Obstetrics Committee, and approved by the Executive and Council of the Society of Obstetricians and Gynaecologists of Canada

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Key Words: Obesity, pregnancy, obstetric anaesthesia, Caesarean section, body mass index, ultrasound, decision to delivery interval

Abstract

Objective: To review the evidence and provide recommendations for the counselling and management of obese parturients.

Outcomes: Outcomes evaluated include the impact of maternal obesity on the provision of antenatal and intrapartum care, maternal morbidity and mortality, and perinatal morbidity and mortality.

Evidence: Literature was retrieved through searches of Statistics Canada, Medline, and The Cochrane Library on the impact of obesity in pregnancy on antepartum and intrapartum care, maternal morbidity and mortality, obstetrical anaesthesia, and perinatal morbidity and mortality. Results were restricted to systematic reviews, randomized controlled trials/controlled clinical trials, and observational studies. There were no date or language restrictions. Searches were updated on a regular basis and incorporated in the guideline to April 2009. Grey (unpublished) literature was identified through searching the websites of health technology assessment and health technology assessment-related agencies, clinical practice guideline collections, clinical trial registries, and national and international medical specialty societies.

Values: The evidence obtained was reviewed and evaluated by the Maternal Fetal Medicine and Clinical Practice Obstetric Committees of the SOGC under the leadership of the principal authors, and recommendations were made according to guidelines developed by the Canadian Task Force on Preventive Health Care.

Benefits, Harms, and Costs: Implementation of the recommendations in this guideline should increase recognition of the issues clinicians need to be aware of when managing obese women in pregnancy, improve communication and consultation amongst the obstetrical care team, and encourage federal and provincial agencies to educate Canadians about the values of entering pregnancy with as healthy a weight as possible.

Recommendations

1. Periodic health examinations and other appointments for gynaecologic care prior to pregnancy offer ideal opportunities to raise the issue of weight loss before conception. Women should be encouraged to enter pregnancy with a BMI < 30 kg/m^2, and ideally < 25 kg/m^2. (III-B)
2. BMI should be calculated from pre-pregnancy height and weight. Those with a pre-pregnancy BMI > 30 kg/m^2 are considered obese. This information can be helpful in counselling women about pregnancy risks associated with obesity. (II-2B)
3. Obese pregnant women should receive counselling about weight gain, nutrition, and food choices. (II-2B)

Key to evidence statements and grading of recommendations, using the ranking of the Canadian Task Force on Preventive Health Care

Quality of evidence assessment*	Classification of recommendations†
I: Evidence obtained from at least one properly randomized controlled trial	A. There is good evidence to recommend the clinical preventive action
II-1: Evidence from well-designed controlled trials without randomization	B. There is fair evidence to recommend the clinical preventive action
II-2: Evidence from well-designed cohort (prospective or retrospective) or case-control studies, preferably from more than one centre or research group	C. The existing evidence is conflicting and does not allow to make a recommendation for or against use of the clinical preventive action; however, other factors may influence decision-making
II-3: Evidence obtained from comparisons between times or places with or without the intervention. Dramatic results in uncontrolled experiments (such as the results of treatment with penicillin in the 1940s) could also be included in this category	D. There is fair evidence to recommend against the clinical preventive action
III: Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	E. There is good evidence to recommend against the clinical preventive action
	L. There is insufficient evidence (in quantity or quality) to make a recommendation; however, other factors may influence decision-making

*The quality of evidence reported in these guidelines has been adapted from The Evaluation of Evidence criteria described in the Canadian Task Force on Preventive Health Care.[79]

†Recommendations included in these guidelines have been adapted from the Classification of Recommendations criteria described in the The Canadian Task Force on Preventive Health Care.[79]

4. Obese women should be advised that they are at risk for medical complications such as cardiac disease, pulmonary disease, gestational hypertension, gestational diabetes, and obstructive sleep apnea. Regular exercise during pregnancy may help to reduce some of these risks. (II-2B)
5. Obese women should be advised that their fetus is at an increased risk of congenital abnormalities, and appropriate screening should be done. (II-2B)
6. Obstetric care providers should take BMI into consideration when arranging for fetal anatomic assessment in the second trimester. Anatomic assessment at 20 to 22 weeks may be a better choice for the obese pregnant patient. (II-2B)
7. Obese pregnant women have an increased risk of Caesarean section, and the success of vaginal birth after Caesarean section is decreased. (II-2B)
8. Antenatal consultation with an anaesthesiologist should be considered to review analgesic options and to ensure a plan is in place should a regional anaesthetic be chosen. (III-B)
9. The risk of venous thromboembolism for each obese woman should be evaluated. In some clinical situations, consideration for thromboprophylaxis should be individualized. (III-B)

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INTRODUCTION

The people of industrialized nations, including Canada, have experienced a dramatic increase in obesity in recent times[1] The proportion of overweight and obese women in Canada rose from 34% in 1978 to 40% in 1992, and in 2004 it was 53%.[2,3] Of particular concern is the rapid increase in overweight and obesity in Canada's adolescents, in whom rates have risen 100% since 1978.[4] Rising rates of obesity are associated with increasing time spent in front of the television and computer, a sedentary lifestyle, and poor nutrition.[4] The lifestyle that leads to obesity has a direct effect on indicators of health. Women who are overweight or obese are significantly more likely to suffer from high blood pressure, diabetes, and heart disease.[3] Concordantly, rates of obesity in pregnancy are increasing.[5] This guideline examines the impact of obesity on maternal, fetal, and neonatal outcomes. Recommendations for the management of obese patients in pregnancy are quantified according to the evaluation of evidence guidelines developed by the Canadian Task Force on Preventive Health Care (Table 1).

DEFINING OBESITY

The most clinically relevant definition of obesity is the body mass index. BMI is weight in kilograms divided by height in meters squared (kg/m^2).[6] Canadian guidelines for appropriate BMI are aligned with those of the World Health Organization and separated into six categories (Table 2).[3]

Studies of the non-pregnant population show that increasing values of BMI are associated with an increased risk for cardiovascular disease, diabetes, osteoarthritis, and cancer.[3]

The definition of obesity in pregnancy varies by author and includes women who are 110% to 120% of their ideal body weight or > 91 kg (200 lbs) or who have a BMI > 30 kg/m^2. There is a paucity of information describing the prevalence of overweight and obesity specifically in the pregnant population. However, BMI data from the 2004 Canadian

Community Health Survey estimate rates of obesity between 11% and 21% for women of child-bearing age.[3] Women who were more active and had higher fruit and vegetable consumption had lower rates of obesity.[3] Obesity in pregnancy is increasing. According to Nova Scotia's Atlee perinatal database, using a definition of obesity as > 90 kg, the rate of obesity rose from 3.2% in 1988 to 10.2% in 2002.[7]

Most obstetrical caregivers in Canada record pre-pregnancy weight in the antenatal record, although documentation of maternal height is inconsistent.[7] Recent evidence from the United States suggests that many obstetrician- gynaecologists use BMI data to screen for obesity.[8] The identification of women at risk is not routinely followed by interventions. Suggested strategies include behavioural weight loss treatments and specific counselling regarding exercise, diet, and pregnancy weight gain.[8]

WEIGHT GAIN IN PREGNANCY

Women should set pregnancy weight gain goals based on their pre-pregnancy BMI as shown in Table 3.[9]

To achieve these goals women should be at the healthiest weight possible when they enter pregnancy. During well-woman checks and other health care interactions, non-pregnant women of child-bearing age can be advised of their BMI. An evaluation of dietary intake and exercise habits can provide insight into women at risk.[10] According to the joint guidelines on exercise in pregnancy by the SOGC and the Canadian Society for Exercise Physiology, all pregnant women without contraindications should participate in regular exercise.[11] During prenatal visits women can be questioned and advised about their diet and exercise habits. Where available, nutritional counselling can be a helpful adjunct for women not meeting the weight gain guidelines in Table 3.[12] Pregnancy outcomes are related to maternal weight gain.[13] Fifty-two percent of a Canadian cohort of women gained more than the recommended weight in pregnancy. Depending on pre-pregnancy BMI, these pregnancies were at increased risk of macrosomia > 4000 g, augmentation of labour, gestational hypertension, and neonatal metabolic abnormalities. Regardless of BMI, those women who gained the recommended amount of weight in pregnancy had fewer adverse outcomes (Caesarean section, gestational hypertension, birth weight < 2500 g or ≥ 4000 g).[13]

IMPACT OF OBESITY ON OBSTETRIC OUTCOMES

Ultrasound

With the exception of women who are underweight, most women are best assessed at 18 to 22 weeks to allow better evaluation of fetal structures.[14,15] The sonographer's ability to evaluate fetal structures is largely dependent on maternal size. Approximately 15% of normally visible structures will be suboptimally seen in women with a BMI above the 90th percentile.[15] In women with a BMI above the 97.5th percentile, only 63% of structures are well visualized. The anatomic structures commonly less well seen with increasing BMI include the fetal heart, spine, kidneys, diaphragm, and umbilical cord.[16] Repeat examinations 2 to 4 weeks later to assess the fetal cardiac anatomy will reduce the number of suboptimally viewed fetuses; however, 12% to 20% (depending on BMI class) will remain poorly visualized.[15] Obstetric care providers should take BMI into consideration when arranging for fetal anatomic assessment in the second trimester. Anatomic assessment at 20 to 22 weeks may be a better choice for the obese pregnant patient.

The challenge of fetal ultrasound in obese mothers is further complicated by evidence suggesting an increased rate of fetal anomalies. Nuthalapaty and Rouse[17] reviewed 17 studies published between 1978 and 2003 associating maternal pre-pregnancy BMI with congenital anomalies. They reported a two-fold increase in neural tube defects in the offspring of obese women. A dose-response was noted, with heavier women having an even higher risk. Their report is supported by the findings of Anderson et al.[18] Alarmingly, the protective effects of periconceptional folic

Table 2. BMI classification

	BMI range	Risk of developing health problems
Underweight	< 18.5	Increased
Normal weight	18.5 to 24.9	Least
Overweight	25.0 to 29.9	Increased
Obese Class I	30.0 to 34.9	High
Obese Class II	35.0 to 39.9	Very high
Obese Class III	≥ 40.0	Extremely high

Table 3. Pregnancy weight gain based on BMI

	BMI range	Suggested weight gain (kg)
Underweight	< 18.5	12.5 to 18
Normal weight	18.5 to 24.9	11.5 to 16
Overweight	25.0 to 29.9	7 to 11.5
Obese Class I	30.0 to 34.9	7
Obese Class II	35.0 to 39.9	7
Obese Class III	≥ 40.0	7

acid do not appear to benefit the obese woman.[19] It is unknown whether an increased dose of folic acid would reduce the risk to that of a lean woman. In their review, Nuthalapaty and Rouse[17] also found associations between obesity and risk of other congenital malformations such as heart defects, ventral wall defects, and orofacial clefts but commented that these data were less consistent.

Ultrasound estimation of fetal weight is not superior to clinical estimation in the obese population.[20] Although both methods have an associated error of approximately 10%, in the series reported by Field et al.,[20] 30% of obese women had an ultrasound estimated fetal weight within 5 days of delivery that was > 10% different from the actual birth weight.

PREGNANCY COMPLICATIONS

Spontaneous Abortion

The risk of spontaneous abortion is increased in obese women. Using a retrospective case–control model and a sample size of 4932, Lashen et al.[21] identified an odds ratio for spontaneous abortion of 1.2 (95% CI 1.01 to 1.46) for obese women (BMI > 30 kg/m^2). The authors also identified an increased risk of recurrent early miscarriages (more than 3 successive miscarriages < 12 weeks' gestation) in the obese population, odds ratio 3.5 (95% CI 1.03 to 12.01).[21] Similar risks have been identified in obese women undergoing in vitro fertilization therapy.[22]

Hypertensive Disorders of Pregnancy

Robinson et al.[7] reviewed pregnancy outcomes stratified by maternal pre-pregnancy weight, comparing women whose weight was 55 to 75 kg with those whose weight was > 90 kg.[7] In this 15-year retrospective review (1988–2002), there were 79 005 women between 55 and 75 kg, 9355 women between 90 and 120 kg (moderate obesity) and a further 779 women > 120 kg (severe obesity). Compared with the normal weight group, the odds ratio of pregnancy induced hypertension for the moderate obesity group was 2.38 (95% CI 2.24 to 2.52). The odds ratio for the severe obesity group was 3.00 (95% CI 2.49 to 3.62). Obesity also increased the likelihood that women would experience more severe forms of hypertensive complications. For the moderate obesity group the odds ratio of severe pregnancy induced hypertension, including HELLP syndrome, was 1.56 (95% CI 1.35 to 1.80) and for the severe obesity group was 2.34 (95% CI 1.59 to 3.46). Relative to non-obese women there was 1 excess case of pregnancy induced hypertension for every 10 moderately obese women and every 7 severely obese women.[7] These findings have been confirmed by others.[23] In contrast, retrospective cohorts show a 24% to 60% reduction in preeclampsia in nulliparous women who had increasing levels of exercise both during the pregnancy and in the year prior to conception.[24,25] Postulations on the protective mechanisms of exercise against preeclampsia include enhanced placental growth and vascularity, prevention and reduction of oxidative stress, and correction of vascular endothelial dysfunction.[26]

Gestational Diabetes

It is well documented that rising rates of obesity in North America are responsible for the concordant rise in type 2 diabetes in the general population.[27] Pre-gestational diabetes is more prevalent in obese women. Therefore, testing in women with risk factors early in pregnancy is recommended.[28] Obese women are also at increased risk of developing gestational diabetes.[29] In a cohort of 16 102 women, Weiss et al.[23] found that in contrast to control subjects (BMI < 30 kg/m^2), the odds ratio for obese women (BMI 30 to 34.9 kg/m^2) to develop gestational diabetes is 2.6 (95% CI 2.1 to 3.4) and for morbidly obese women (BMI ≥ 35 kg/m^2) is 4.0 (95% CI 3.1 to 5.2). Not surprisingly, obese women are also at increased risk of having a macrosomic child. The likelihood of delivering an infant weighing more than 4000 g was 1.7 times (95% CI 1.4 to 2.0) greater for obese and 2.0 times (95% CI 1.5 to 2.3) greater for morbidly obese patients. The odds of delivering an infant weighing more than 4500 g was 2.0 times (95% CI 1.4 to 3.0) and 2.4 times (95% CI 1.5 to 3.8) greater for obese and morbidly obese patients, respectively.[22] Physical activity is inexpensive and can significantly reduce the risk of gestational diabetes. Zhang et al.[29] reported a significant inverse relationship between the amount of weekly vigorous activity and the risk for gestational diabetes. More relevant to the obese population, they also reported a 34% reduction in the development of gestational diabetes in women who did not participate in vigorous exercise but who did participate in brisk walking compared with those who participated in easy pace walking.[28] At a Canadian centre, regular walking has been used in addition to diet and insulin as part of therapy for gestational diabetes. Compared with a non-exercising matched control group, those who included walking 25 to 40 minutes 3 to 4 times per week were able to significantly reduce fasting and 1-hour postprandial glucose levels using less insulin over fewer injections. The study design did not permit comment on perinatal outcomes.[30]

INTRAPARTUM COMPLICATIONS AND MANAGEMENT

Macrosomia and Shoulder Dystocia

Sheiner et al.[31] analyzed pregnancy outcomes in a cohort of 126 080 deliveries. Patients with hypertension and diabetes were excluded. Obese women (BMI > 30 kg/m^2) had an

increased risk of fetal macrosomia with an odds ratio of 1.4 (95% CI 1.2 to 1.7). Sheiner et al.[31] did not find an increased risk for shoulder dystocia in the obese population. Jensen et al.[32] found similar results in their cohort. The use of antenatal ultrasound to detect fetal macrosomia is associated with increased obstetric interventions such as induction of labour and Caesarean section.[33] Delpapa and Mueller-Heubach[33] reported 86 women with an estimated fetal weight > 4000 g within 3 days of delivery. In 77%, the ultrasound estimate was greater than the actual birth weight.[33] The rate of Caesarean section is affected when sonographic examination indicates a macrosomic fetus.[34] Parry et al.[34] compared the rate of Caesarean section when fetal macrosomia was incorrectly predicted by antenatal ultrasound with the rate of Caesarean section in pregnancies when antenatal ultrasound correctly predicted the fetal weight not to be macrosomic. The estimated fetal weight for the predicted macrosomic group was significantly greater than that of the non-macrosomic group: 42.3% versus 24.3%, RR 1.74, (95% CI, 1.09 to 2.78).[34] Although fetal macrosomia is a risk factor for shoulder dystocia, the absolute risk of a severe shoulder dystocia associated with permanent impairment, or death, remains low.[35] When the sensitivity and specificity of ultrasound to predict a birth weight > 4500 g are included, it is estimated that 3695 non-diabetic women would require Caesarean section to prevent a single case of permanent brachial plexus injury due to shoulder dystocia.[35]

Fetal Monitoring

External fetal monitoring is at times more difficult in the presence of maternal obesity given the challenge of transducing the fetal heart through the maternal pannus. There is no evidence to support the routine use of internal fetal monitoring in this population, but it may be more effective in some women.

Uterine Monitoring

There is increasing evidence that uterine contractility in obese women, compared with normal weight women, may be altered or impaired.[36,37] It is unclear whether these alterations in myometrial response may lead to abnormal labour and the observed increase in risk of Caesarean delivery. Monitoring contractions and ensuring adequate labour in obese women poses a special challenge. Although most obstetric care providers rely on manual palpation and/or external tocometry, the use of an intrauterine pressure catheter may be advantageous in some cases. Newer techniques, such as electrohysterography, may prove superior to both tocodynometry and intrauterine pressure assessment for labour monitoring in this population.[38]

Caesarean Section

The risk of Caesarean section is increased in the obese parturient. Dietz et al.[39] analyzed 24 423 nulliparous women stratified by pre-pregnancy BMI and pregnancy complications. The Caesarean section rate was 14.3% for lean women (BMI < 19.8 kg/m^2) and 42.6% for very obese women (BMI ≥ 35 kg/m^2). Among women without any complications, the relative risk of Caesarean section was 1.4 (95% CI 1.0 to 1.8) for overweight women (BMI 25 to 29.9 kg/m^2), 1.5 (95% CI 1.1 to 2.1) for obese women (BMI 30 to 34.9 kg/m^2), and 3.1 (95% CI 2.3 to 4.8) for very obese women (BMI ≥ 35 kg/m^2).[39] Large cohorts from differing jurisdictions show similar findings.[22,40] The increase in the rate of Caesarean section may be due, in part, to the fact that overweight and obese nulliparous women progress more slowly through the first stage of labour.[41] When faced with lack of descent in the second stage of labour, some practitioners may opt for Caesarean section rather than operative vaginal delivery because of concerns about fetal macrosomia and shoulder dystocia. This may explain the decreased operative vaginal delivery rate in some series.[42]

Obese women undergoing Caesarean section experience more complications, including blood loss > 1000 mL, increased operative time, increased postoperative wound infection and endometritis, and need for vertical skin incision.[43,44] Those obese women with diabetes who undergo Caesarean section have an odds ratio for postoperative wound infection of 9.3 (95% CI 4.5 to 19.2), and those who require a vertical skin incision have a 12% rate of wound complication serious enough to require opening the incision.[43,45] Postoperative infections are even increased in those obese women who have elective Caesarean section with prophylactic antibiotics.[46]

Hospitals should ensure that there is an operating room table that can accommodate morbidly obese parturients. Similarly, hospitals and obstetrical caregivers should ensure there are appropriate surgical instruments to adequately visualize and operate on obese patients who require Caesarean section.

Vaginal Birth After Caesarean Section

In the absence of contraindications, women who have had their first child by Caesarean section are asked to consider vaginal birth in subsequent pregnancies.[47] The success of vaginal birth after Caesarean section is commonly quoted at 80%.[48] Obese women are less likely than their lean peers to be successful in delivering vaginally after previous Caesarean section. In women with a BMI > 29 kg/m^2 the success rate is 54% to 68%.[49,50] The rate of success is further reduced in even heavier women. Chauhan et al.[51] found a 13% VBAC success rate in women > 300 lbs (136 kg). When

discussing VBAC, obstetric care providers should consider the longer time required to prepare for and commence Caesarean section in obese patients. This includes longer time for patient transport and set-up in an operating room, longer time for establishment of anaesthesia, and longer time from incision to delivery of the fetus. Obese women would benefit from knowing the success rates for women in their BMI group when they make a decision about vaginal birth after Caesarean section.

Obstetric Anaesthesia

Rates of difficult or failed tracheal intubations are increased in obese parturients.[52] A 6-year review of failed intubations in obstetric patients in a United Kingdom region reported 36 cases of failed intubation; the average BMI of these women was found to be 33.[53] The equipment and expertise required to manage a difficult intubation should be readily available. In obese patients the risk of epidural failure is increased. The initial failure rate for epidural catheter placement can be very high (42%),[54] and multiple attempts at catheter placement may be required. More than a single attempt is necessary for successful epidural placement in approximately 75% of morbidly obese parturients. and more than three attempts are needed in 14%.[55] The use of regional anaesthesia may require significant time and staff resources, which may limit its use in some health care settings. Techniques to improve the success of regional anaesthesia in obese pregnant women, such as ultrasound guidance, will require further investigation in obstetrics.[56] Given the increased risks of regional anaesthesia in this population, and dependent on the wishes of the patient, consideration should be given to early epidural in labour. Obese women have an increased risk for sleep apnea, which may influence the choice of location for postoperative care for obese parturients.

Caesarean Section and Decision to Delivery Interval

The decision to delivery interval may be longer when an emergent or urgent Caesarean section is required for an obese parturient. Causes for this delay may include patient transport and bed transfer, the establishment of adequate analgesia, and the operative time from incision to delivery. The performance of emergent Caesarean section within 30 minutes is an arbitrary threshold rather than an evidence-based standard. Thomas et al.[57] reviewed 17 780 emergency Caesarean sections performed in 2000 in England and Wales. Only 22% of women were delivered within 30 minutes. Of the 4622 Caesarean sections performed for immediate threat to the life of the mother or fetus only 46% were achieved within 30 minutes. There was no difference noted in the rate of 5-minute Apgar scores < 4 or < 7, or the rate of stillbirth between those delivered less than 15 minutes and those delivered between 16 and 75 minutes after the decision to proceed to Caesarean section.[57] There are no published data from Canadian centres that indicate whether obstetric providers can reliably meet this arbitrary standard. There are no published data that address decision to delivery interval in obese patients.

Thromboembolism

The risk of thromboembolism is increased in obese parturients. Edwards et al.[58] reported 683 obese women (BMI > 29 kg/m^2) who were matched to 660 women of normal weight (BMI 19.8 to 26.0 kg/m^2). The incidence of thromboembolism was 2.5% in the obese women, and only 0.6% in the control subjects.[58] The Royal College of Obstetricians and Gynaecologists (RCOG) in the United Kingdom recommends thromboprophylaxis for 3 to 5 days, using low molecular weight heparin after vaginal delivery for women who are over age 35 and have a pre-pregnancy or early pregnancy BMI > 30 kg/m^2 or weight > 90 kg.[59] In addition, the RCOG recommends thromboprophylaxis before and for 3 to 5 days following Caesarean section for women with a pre-pregnancy or early pregnancy BMI > 30 kg/m^2 or with a current weight > 80 kg. The RCOG also recommends considering thromboprophylaxis in "extremely obese" women who are hospitalized antenatally.[59,60] However, the Pregnancy and Thrombosis Working Group in the United States does not concur with the RCOG guidelines. This group recommends consideration of thromboprophylaxis for patients who are obese, on bed rest, or having surgery.[61] There have been no randomized controlled trials regarding thromboprophylaxis when there are additional factors to consider in the obese parturient. Therefore, the risk of venous thromboembolism for each obese woman should be evaluated. Depending on the clinical situation, consideration for thromboprophylaxis should be individualized.

PERINATAL OUTCOMES

The most prevalent risk factor for unexplained stillbirth is pre-pregnancy obesity.[62] The odds ratio for stillbirth is 2.79 (95% CI 1.94 to 4.02) for morbidly obese women (BMI ≥ 35 kg/m^2).[63] The mechanisms suggested for increased stillbirth risk in the obese woman include a decreased ability to perceive a reduction in fetal movement, hyperlipidemia leading to atherosclerosis affecting placental blood flow, and increased snoring and sleep apnea associated with oxygen desaturation and hypoxia.[57]

There is a growing body of literature demonstrating the in utero environment is a predictor of future neonatal, child, and adult health.[64] In the Growing Up Today Study, a cohort of over 14 000 adolescents in the United States, a 1 kg increment in birth weight in full-term infants was

associated with an approximately 50% increase in the risk of being overweight at ages 9 to 14 years.[65] This is especially true for the offspring of women who experienced gestational diabetes during the pregnancy.[63] In the Hypertension in Pregnancy Offspring Study, Himmelmann et al.[66] reported that neonates born to women who were hypertensive during pregnancy appear to have a propensity to impaired glucose tolerance in later childhood.[66] Taittonen et al.[67] have also reported an increased risk of hypertension in the children of women who are hypertensive during pregnancy .

THERAPY AND MANAGEMENT

All women should be encouraged to participate in regular physical exercise during their pregnancy.[11] Joint recommendations by the SOGC and the Canadian Society for Exercise Physiology were published in 2003.[11] It is recommended that women exercise four times weekly at moderate intensity. The actual effect of these recommendations is hard to measure because of the difficulty of behavioural change assessment; however, the rising obesity rate in the Canadian pregnant population and the maternal and neonatal sequelae described above are most disturbing. Heart rate target zones for previously sedentary obese pregnant women have recently been developed, using a Canadian population. Davenport et al. recommend target heart rate zones of 102 to 124 beats per minute in obese women aged 20 to 29, and 101 to 120 beats per minute in those aged 30 to 39.[68]

Nutritional counselling and dietary records may be helpful in guiding overweight and obese women with respect to adequate weight gain during pregnancy. Ideally these should be offered prior to pregnancy so that health status can be optimized before conception.[69] The role of behavioural therapy and caloric restriction in obese women to prevent excess weight gain has not been established. Randomized controlled studies using behavioural intervention in normal weight and obese women with the goal of preventing excess weight gain have been inconclusive.[70] A systematic review examining energy and protein restriction as preventive strategies to avoid adverse perinatal outcomes concluded these measures are unlikely to be beneficial and may pose harm to the developing fetus.[71]

The rate of unintended pregnancy increases following bariatric or gastric bypass surgery in morbidly obese women. Although this therapy is not recommended during pregnancy, it may arise as a discussion point during pre-pregnancy or postpartum visits. New evidence and systematic reviews suggest that weight loss surgery is more effective than conventional treatments in morbid obesity (Table 2). Thus, women who meet the criteria may benefit from counselling and consultation with obesity surgery specialists.[72] A limited but growing body of literature regarding pregnancy outcomes in women who have undergone obesity surgery suggests reassuring outcomes; however, there are reports of significant complications such as nutrient deficiency, severe fetal growth restriction, and maternal bowel obstruction.[73–78]

SUMMARY

It is critical that women be informed prior to pregnancy about the need to be as healthy as possible before becoming pregnant, which includes having a normal BMI, eating a balanced diet, and participating in regular exercise. It is also critical that provincial and federal authorities recognize the impact on future populations and health care costs of pregnancies complicated by obesity. A long-term national information campaign is required to exploit women's interest in having as healthy a pregnancy as possible by giving them the information they need to become fit and have a normal BMI before they consider pregnancy. Only a national strategy can change the complacency about pre-pregnancy weight and inform women about the significant increase in risks for themselves and their children.

Recommendations

1. Periodic health examinations and other appointments for gynaecologic care prior to pregnancy offer ideal opportunities to raise the issue of weight loss before conception. Women should be encouraged to enter pregnancy with a BMI < 30 kg/m^2, and ideally < 25 kg/m^2. (III-B)

2. BMI should be calculated from pre-pregnancy height and weight. Those with a pre-pregnancy BMI > 30 kg/m^2 are considered obese. This information can be helpful in counselling women about pregnancy risks associated with obesity. (II-2B)

3. Obese pregnant women should receive counselling about weight gain, nutrition, and food choices. (II-2B)

4. Obese women should be advised that they are at risk for medical complications such as cardiac disease, pulmonary disease, gestational hypertension, gestational diabetes, and obstructive sleep apnea. Regular exercise during pregnancy may help to reduce some of these risks. (II-2B)

5. Obese women should be advised that their fetus is at an increased risk of congenital abnormalities, and appropriate screening should be done. (II-2B)

6. Obstetric care providers should take BMI into consideration when arranging for fetal anatomic assessment in the second trimester. Anatomic assessment at 20 to 22 weeks may be a better choice for the obese pregnant patient. (II-2B)

7. Obese pregnant women have an increased risk of Caesarean section, and the success of vaginal birth after Caesarean section is decreased. (II-2B)

8. Antenatal consultation with an anaesthesiologist should be considered to review analgesic options and to ensure a plan is in place should a regional anaesthetic be chosen. (III-B)

9. The risk of venous thromboembolism for each obese woman should be evaluated. In some clinical situations, consideration for thromboprophylaxis should be individualized. (III-B)

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