

# Obesity in pregnancy – The bigger issues

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## Abstract

Maternal obesity increases the risk of poor pregnancy outcomes, including infertility, miscarriage, foetal anomalies, hypertensive disorders of pregnancy, gestational diabetes mellitus, risk of induction and failed induction, prolonged labour, caesarean section, post partum haemorrhage, infection and anaesthetic complications. As the prevalence of obesity in reproductive aged women is increasing, the practicing clinician must be aware of the risks and current management strategies to facilitate a healthy pregnancy and delivery in these women.

**Keywords:** obesity; pregnancy; gestational diabetes; pregnancy outcomes; management.

## Definition and Prevalence

Obesity is defined as a body mass index (BMI) of equal to or greater than 30kg/m<sup>2</sup>, using the formula weight (in kilograms) divided by the square of the person's height (in metres). Ideally calculated pre-conception, in pregnancy this measurement is usually taken at the first antenatal appointment. The World Health Organization (WHO) classification of classes of obesity is shown in Table 1.

**Table 1. WHO classes of body mass index**

<i>Body mass index</i>	
Underweight	< 18.5
Normal range	18.5 – 24.9
Overweight	≥ 25.0
Preobese	25.0 – 29.9
Obese	≥ 30.0
Obese class I	30.0 – 34.9
Obese class II	35.0 – 39.9
Obese class III	≥ 40.0

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The World Health organization, in the non-communicable diseases country profiles published in 2011, lists the prevalence of overweight Australian females to be 59.3%, while the prevalence of obesity is said to be 27.1%. These figures are comparatively high when looking at the data from Sri Lankan women in the same publication, who have an overweight rate of 26.8% and an obesity rate of only 7.4%<sup>1</sup>. However, studies from more urban regions of Sri Lanka estimated the prevalence of obesity in women to be 36.5% in a 2005 study of 4 provinces<sup>2</sup>, and 32.2% (among adult Sri Lankans – male and female) in a study of adult weight in Colombo<sup>3</sup>. There is no specific data that differentiates the rate of obesity among women of child-bearing age. Despite the apparent differences between the two countries in the proportion of obese women, what is evident is that mean BMI is on the rise in both. With well-documented evidence of the direct relationship between maternal overweight and increased risk of pregnancy complications, the implications for obstetric practice cannot be overlooked<sup>4,6</sup>.

This review will examine the evidence relating to pregnancy risks with increasing maternal weight, with a view to suggesting management in order to ensure the best outcomes for both mother and baby.

## Preconception

Obese women are more likely to suffer from ovulatory dysfunction and infertility than their ideal-weight counterparts. When they do conceive, either naturally or through assisted techniques, there is an increased rate of miscarriage<sup>7,8</sup>. Ideally, BMI should be optimised preconception through diet and lifestyle counselling and specialised weight-reduction programs. It is appropriate for women with a BMI of > 40kg/m<sup>2</sup>, or concurrent obesity related medical conditions such as sleep apnoea, coronary artery disease or preexisting diabetes mellitus to be referred for consideration of bariatric surgery<sup>9,10</sup>. It is preferable to delay conception for 12-18 months post surgery to allow recovery after any surgical complications and avoid pregnancy in a period of rapid weight loss. The care provider for the post-surgical gravid woman must be aware of possible nutritional deficiencies due to malabsorption after a bypass procedure. Also, gastric bands may have to be adjusted during the course of the pregnancy. Irrespective of BMI, obese patients should be advised that limited weight gain, rather than weight loss, is the goal during pregnancy. The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) guidelines for weight-gain goals are listed in Table 2.

**Table 2. Singleton pregnancy weight-gain goals according to starting BMI (RANZCOG)**

<i>Pre-pregnancy BMI</i>	<i>Recommended weight gain during pregnancy</i>
≤18.5	13 - 18kg
18.5 - 24.9	11 - 16kg
25.0 - 29.9	7 - 11kg
30.0 - 34.9	4 - 11kg
35.0 - 39.9	0 - 4kg
≥ 40.0	0kg weight gain, lose up to 4kg

**Box 1. Increased pregnancy-related risks in obese women**

Preconception	Ovulatory dysfunction, infertility
Early pregnancy	Miscarriage, fetal anomalies, difficult and less accurate ultrasound examination
Antenatal	Hypertensive disorders of pregnancy, gestational diabetes mellitus, venous thromboembolism
Intrapartum	Induction of labour, failed induction, shoulder dystocia, cesarean section, anaesthetic difficulties
Postpartum	Haemorrhage, infection, venous thromboembolism
Fetal	Macrosomia, perinatal morbidity and mortality, birth injury, childhood obesity and diabetes

The risk of fetal abnormality, including neural tube defects and cardiac defects is higher in pregnancies of obese women even after adjusting for gestational diabetes mellitus<sup>11,12</sup>. As such, obese women should be advised to take 5 mg of folic acid daily, ideally from preconception to the end of the first trimester. There is also documented evidence of an inverse relationship between pre-pregnancy BMI and Vitamin D, indicating that women with a BMI >30 are at higher risk of being vitamin D deficient, and should be considered for supplementation (10 mcg daily) preconception and continue for the duration of breastfeeding<sup>14,15</sup>.

**Antenatal**

The increased risk of fetal abnormality in babies of obese mothers comes with it's own inherent problems, in that ultrasound is the gold standard in the diagnosis of structural defects. Poor visualization due to maternal body habitus often necessitates more than one morphological assessment, increasing the burden of healthcare cost. In a recent study of 10112 pregnancies, the detection rate for fetal abnormalities was 20% lower in obese women than in those with a normal BMI<sup>16</sup>. The rate of fetal loss with invasive diagnostic testing including chorionic villus sampling and amniocentesis is higher in larger women, with one study demonstrating a fetal loss rate of 4.4% in

women with a BMI of 25-27, 2.1% with BMI 20-25 and 1% with BMI <20. This difference was attributed to significant difficulty in completing the procedure and a consequent increase in post procedure amniotic fluid leak in heavier women<sup>17</sup>.

**Gestational Diabetes Mellitus**

Gestational diabetes mellitus (GDM) is diagnosed in more than three times as many obese mothers than in those with normal-range BMIs<sup>18</sup>. As such, women with a booking BMI of 30kg/m<sup>2</sup> or more should be offered screening in the form of a 2hr 75g oral glucose tolerance test performed at 26-28 weeks<sup>19</sup>. Some centres also recommend screening women with a BMI of >50, or those with additional risk factors, at their first antenatal visit, as rates of undetected pre-existing impaired glucose tolerance is likely high in this cohort<sup>20</sup>.

**Pre-Eclampsia**

The association between pre-eclampsia and maternal obesity is evident. A study of 96 801 nulliparous women demonstrated the risk of developing pre-eclampsia is 3.3 times higher in obese women than those with a BMI of <20kg/m<sup>2</sup>.<sup>21</sup> Additionally, for every 5-7kg/m<sup>2</sup> in additional bodyweight, the risk of pre-eclampsia was twofold<sup>22</sup>. It is critical that a variety of cuff sizes are available in the clinical setting and that all

blood pressure measurements are taken with an appropriate sized cuff to ensure accurate assessment. Characteristics of obesity including dyslipidemia, insulin resistance and chronic inflammation and their likely link with pre-eclampsia leads to recommendation by the National Institute for Health and Clinical Excellence (NICE) of a low dose (75 mg daily) of aspirin from 12 weeks gestation for women with a BMI of >35 kg/m<sup>2</sup>.<sup>23</sup>

**Macrosomia**

Obese women are more likely to deliver macrosomic babies (birth-weight >4kg and >90th centile for gestational age)<sup>24</sup>. In addition to the increased risk of GDM and therefore elevated serum glucose, other metabolic disturbances including raised serum triglyceride levels are thought to have an impact on increasing birthweight. In fact, maternal obesity is a better predictor of fetal macrosomia than GDM, which more reliably predicts neonatal hypoglycaemia<sup>25-27</sup>.

Maternal obesity also makes assessment of fetal growth using symphyseal-fundal height inaccurate, and care providers are more likely to miss small for gestational age and macrosomic babies. Assessment of presentation and lie through abdominal palpation in late pregnancy are also difficult, presenting a problem for small centres without ready access to ultrasound.

**Timing of birth**

Babies of obese women have a high risk of medically indicated preterm birth (as opposed to spontaneous preterm birth) due to maternal medical complications<sup>28</sup>. This is in contrary to the inherent risk of prolonged gestation in those obese women who do not require early delivery due to comorbidities. Women with a BMI >30kg/m<sup>2</sup> are more likely to require induction of labour for postdate pregnancies. In addition, they have a higher failure rate for medical induction than their normal BMI counterparts<sup>29,30</sup>.

## Intrapartum

The ability to provide accurate intrapartum fetal monitoring must be considered before the decision to induce or augment the labour of an obese woman. The use of fetal scalp electrodes or ultrasound assessment is likely to be required to obtain adequate assessment of fetal wellbeing, as external cardiotocograph (CTG) monitoring is increasingly unreliable with higher percentages of abdominal fat.

Studies have demonstrated a slower rate of progress in the active phase of labour for overweight and obese women<sup>31</sup>. Myometrial tissue from obese women, collected at the time of cesarean section, shows impaired contractility when compared to the tissue of normal weight women<sup>32</sup>. It is hypothesized that leptin, a hormone released by adipose tissue, may impair uterine contractility, either by inhibiting oxytocin secretion or its direct effect on the myometrium<sup>33</sup>. As such, effective augmentation of labour in obese women may require increased doses of synthetic oxytocin. There is inadequate data to support this currently.

Maternal obesity is one of the most common risks for shoulder dystocia, even after rates are adjusted for macrosomic infants and gestational diabetes. This leads to a greater rate of fetal injury and perineal trauma<sup>34</sup>.

## Cesarean section

Cesarean section rates in both nulliparous and multiparous women are dramatically increased in obese and morbidly obese women. A study involving 329988 women with singleton pregnancies in New York City documented caesarean section rates in nulliparous women (20.7% in the normal BMI group versus 33.8% in the obese group and 47.4% in the morbidly obese group;  $P > 0.01$ ). The adjusted OR was 1.66 (95% CI 1.51, 1.82) in the entire cohort<sup>35</sup>. Other studies report similar rates<sup>36</sup>.

When a cesarean section is indicated in an obese woman, the clinician faces

difficulties with decisions regarding incision type. It is often thought best to avoid incision along the deep fold inferior to the pannus, as high rates of infection have been reported. Similarly, vertical incisions, although providing rapid access and ease of extension should greater access be required, have high rates of post-operative pain, wound infection, dehiscence and hernia formation<sup>37,38</sup>, as well as an increased rate of vertical uterine incisions<sup>39</sup>. Overall, evidence suggests that if the pannus can be retracted cephalad without causing maternal hypotension or respiratory compromise a low transverse incision is preferred<sup>39</sup>. Adhesive straps, tape or extra assistants may be required to achieve optimal operating conditions.

Further problems are encountered upon entering the uterine cavity, as generating sufficient fundal pressure to facilitate delivery is not easily achieved.

Obese women have higher rates of endometritis and postoperative wound infection and dehiscence, after both cesarean section and vaginal births. In cesarean section, pre-incision antibiotics are recommended in addition to closing the subcutaneous fat layer if deeper than 2cm<sup>40,41</sup>. Both are beneficial in reducing the likelihood of infective complications. Women should always be advised of proper wound care and be vigilant for early warning signs.

## Anaesthetics

Early assessment and referral to an anaesthetic service is advisable for all obese pregnant women. High rates of epidural failure, difficult spinal and dural puncture are reported. In addition, if an obese woman requires a general anaesthetic for either emergency delivery or post delivery complications, there is an increased risk of failed intubation and gastric content aspiration<sup>42,43</sup>. The on call anaesthetist should be informed when an obese patient presents in labour, and consultant cover should be available. Early epidural is recommended.

## Postpartum

Increasing maternal weight is closely associated with primary postpartum haemorrhage due to uterine atony, and therefore all obese parturients should be recommended to have active management of third stage of labour<sup>44</sup>.

The risk of thromboembolism is increased in obese women in both the antenatal and postnatal periods<sup>45</sup>. Individual centres should have a protocol in place for thromboprophylaxis in these women, particularly when undergoing cesarean section, including properly fitted antithrombotic stockings and ideally, low molecular weight heparin. Royal College of Obstetricians and Gynaecologists (RCOG) guidelines including information on additional risk factors are available for clinicians<sup>46</sup>.

Failure to return to pre-pregnancy weight is common in all postnatal women, however when the woman has an increased BMI prior to conception, they are even less likely to lose the weight they gained. This effect is exaggerated with increasing BMI from overweight to morbidly obese<sup>47</sup>. Consequently; future pregnancies are put at even higher risk of weight-related complications.

Vaginal births after cesarean section (VBACs) are less successful in obese women. High rates of postnatal depression and difficulties establishing and maintaining breastfeeding have been documented. These women will likely require additional postnatal support in the form of lactation consultation, midwifery care, medical input and possible psychological evaluation. The implications for the children of obese women are also serious, with increased likelihood of childhood obesity and diabetes. The importance of breastfeeding, in addition to diet and lifestyle intervention, and consideration of bariatric surgery cannot be understated in the obese postnatal woman.

## Practice points

- Preconception counselling regarding weight loss, ensuring the obese mother is informed of the increased risks to herself and her child during pregnancy, delivery and postpartum. Referral for specialist nutrition and exercise program if appropriate and available.
- Height, weight and blood pressure should be recorded using appropriate sized cuff, ideally preconception, otherwise at first antenatal visit. Mother given information regarding recommended weight gain during pregnancy. To be reviewed periodically.
- Monitoring of malabsorption for women who have undergone bariatric surgery. Supplementation of 5 mg folate, 10 mcg vitamin D and consideration of low dose aspirin for obese women.
- Baseline bloods and urine protein for monitoring of pre-eclampsia development.
- Consideration of thromboprophylaxis antenatally for very obese women or those with additional risk factors.
- Booking or 24 - 28 week 2hr 75g oral glucose tolerance test.
- Third trimester anaesthetic consultation. Anaesthetist should also be informed when an obese woman presents to the birth suite in labour.
- Pre-incision antibiotics for cesarean section. Avoiding the deep skin fold underneath the pannus when planning incision location. Closing the subcutaneous layer of tissue leads to lower rates of infection.
- Availability of bariatric equipment including appropriate sized operating tables. Additional assistants may be required for cesarean section.
- Active third stage of labour to prevent post partum haemorrhage.
- Reinforce the importance of breastfeeding in post-pregnancy weight loss. Consider referral to a weight-loss specialist before next pregnancy. ■

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