Obesity in pregnancy

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Key points
Obesity in pregnancy significantly increases the risk of maternal and fetal complications.
Maternity units should plan for an increased number of obese parturients.
Local training, guidelines, and equipment should be available for the anaesthetist caring for obese parturients.
Thrombo-embolism is the leading cause of maternal deaths and should be actively prevented in obese mothers.
Regional anaesthesia may be facilitated by ultrasound guidance.

In recent years, the prevalence of obesity among UK women has increased substantially with ~40% being overweight and 25% obese in 2010. In women of childbearing age, the excess body weight is of particular concern with obese parturients experiencing an increased incidence of complications compared with normal weight mothers. In addition to the maternal risks associated with excess body weight, fetal morbidity and mortality is also increased compared with pregnancies of normal weight mothers. Table 1 summarizes the maternal and fetal complications associated with excess maternal body weight. In addition to the consequences originating from perinatal morbidity, the longer-term complications of obesity include further maternal weight gain and an increased risk of development of obesity in the offspring. Furthermore, the increased use of maternity services associated with obesity in pregnancy adds significantly to health-care costs compared with normal weight mothers. Although much work has been put into recommendations on medical care for obese women planning pregnancy, including prenatal weight management and dietary advice, nearly one quarter of UK pregnant women are now obese. Data on the prevalence of maternal obesity from a large UK maternity hospital are presented in Figure 1. With an ever-increasing number of obese parturients, the maternity ward anaesthetist will be required to professionally anticipate and safely assist in the prevention of peripartum complications associated with excess body weight.

Pregnancy and weight gain

The BMI classification is currently the preferred standard by which to stratify maternal body weight. However, total body weight combined with skinfold thickness or thigh circumference may be more appropriate measures to assess the relative composition of weight gain. A BMI (kg m$^{-2}$) of 18.5–24.9 is considered normal, whereas a BMI of 25.0–29.9 and >30 indicates overweight and obesity, respectively.

During pregnancy, maternal weight gain and changes in body composition comprise the growing fetus, placental and amniotic components, and deposits of adipose tissue and fluid. Thus, both the components and energy costs of weight gain during pregnancy are different from weight gained during positive energy balance before and after pregnancy. Such considerations are part of the general recommendations not to initiate dieting during pregnancy as it may harm the health of the unborn child. For weight management, however, recreational and moderate activity is recommended throughout pregnancy and overweight and obese mothers should also be offered professional dietary advice due to specific nutritional requirements, for example, folic acid and vitamin D supplements.

Currently, there are no UK guidelines advising on appropriate weight gain for the normal weight, overweight, and obese parturient, respectively. However, American guidelines recommend that women with a BMI (kg m$^{-2}$) of 18.5–24.9 should gain no more than 11–16 kg during pregnancy. Overweight women with a BMI of 25–29.9 should gain 7–11.5 kg and obese women with BMI >30 only 5–9 kg. Recently, a Canadian study reported on the adherence to pregnancy weight guidelines. The study found that during pregnancy, more than 50% of obese women gained weight in excess of the current recommendations. Hence, if weight management was problematic pre-pregnancy, it does not become any easier during pregnancy.

Anaesthetic implications of obesity in pregnancy

The combined physiological changes of pregnancy and obesity will affect the anaesthetic plan and management of the parturient. Established anaesthetic risk factors associated with pregnancy are compounded by the coexisting obesity and associated medical problems.

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Compared with the general population where failed tracheal intubation occurs with an incidence of \( \approx 1:2500 \), the incidence in the obstetric population is 1:280. Pregnancy combined with obesity further increases the incidence of difficult and failed intubation to 1:3 with an associated difficulty in maintaining adequate manual mask ventilation and oxygenation. These concerns highlight the importance of a thorough airway assessment and planning for both emergency and elective operative procedures that may require general anaesthesia in the obese parturient.

Respiratory system

The normal, \( \approx 25\% \), decrease in functional residual capacity and the increased ventilation–perfusion mismatch predisposing to hypoxia during pregnancy may in the obese parturient be aggravated by specific obesity-associated respiratory compromise. Obstructive sleep apnoea and asthma occur with a higher incidence in the obese population compared with normal-weight individuals. After operation, the obese patient is at increased risk of pulmonary atelectasis and hypoxaemia. Additionally, the work of breathing is increased in obese patients and longer-term obesity may furthermore be associated with restrictive pulmonary disease. Obesity is also associated with pulmonary hypertension and cor pulmonale. Therefore, an obese pregnant woman reporting unusual symptoms of breathlessness will warrant a cardiopulmonary review before labour in order to anticipate pulmonary complications and plan for a safe delivery of the baby.

Cardiovascular system

The cardiovascular requirements normally associated with pregnancy, that is, increase in stroke volume, heart rate, and increased pulse pressure may be poorly tolerated in the obese parturient already displaying obesity-correlated risk factors, for example, hypertension, ischaemic heart disease, and congestive heart failure. The aortocaval compression syndrome is exacerbated in the obese mother due to the presence of increased intra-abdominal adipose tissue which, when added to the gravid uterus, further compromises venous return to the maternal heart and predisposes uterine arterial hypotension. Furthermore, the presence of obesity and hypertension in pregnancy increase the risk of developing peripartum cardiomyopathy.

Gastrointestinal system

The presence of hiatus hernia is common among obese patients. With gastro-oesophageal reflux frequently reported by pregnant women and gastric emptying delayed during labour, obesity presents an additional risk of aspiration due to larger gastric volume compared with normal weight controls. Although, the obese mother may have an increased risk of aspiration, antacid prophylaxis and fasting guidelines are in the UK not routinely different from that prescribed for normal weight mothers. However, some guidelines do recommend considering routine 6 hourly prophylaxis with ranitidine in those women who have a significant risk of requiring general anaesthesia for surgical intervention, parturients with BMI > 30 kg m\(^{-2}\), previous Caesarean delivery, and women with maternal diabetes, respectively.

Practical considerations

Caring for the obese parturient includes the availability of suitable equipment, and maternity services should have a documented process to assess this on a regular basis. This includes immediate access to an ultrasound machine for assisting central venous cannulation, facilities for invasive arterial pressure monitoring, and extra-long spinal and epidural needles. It is recommended that appropriate equipment should be readily available in all locations where the obese parturient may be cared for. Mandatory manual handling courses for staff should include the management of obese

![Maternal obesity](image-url)
patients. Apart from the physical aspects of manual handling, staff must also consider and respect the obese patient’s dignity and integrity. For operative procedures, the use of invasive arterial pressure monitoring should be considered if there are concerns about non-invasive arterial pressure measurement. Added benefits of invasive arterial pressure monitoring include arterial blood gas analysis and ready access to full blood count measurements for assisting in the assessment of blood loss. Obviously, the weight-bearing capacity of delivery beds and operating tables should be adequate to accommodate the obese parturient. Thrombo-embolic prophylaxis with a combination of appropriate size stockings, pneumatic compression devices, and pharmacotherapy is required.\(^7\)

**Anaesthetic management**

The anaesthetic management of the obese parturient should commence in the antenatal clinic with obese women being offered a consultation with an obstetric anaesthetist. During the consultation, an anaesthetic management plan for labour and delivery should be discussed and agreed with the woman. Specific risks associated with obesity in pregnancy should be identified and explained. The anaesthetist should pay close attention to the possibility of associated cardiopulmonary pathology. Practical issues with difficult venous access, regional anaesthesia, and pain relief for labour and operative procedures should be discussed. The anaesthetic antenatal clinic is probably not the time and place for detailed discussions of weight management. Most obese parturients are acutely aware of their weight problem and adding to their anxiety may in part alienate them to the anaesthetist during a time where trust and cooperation is of utmost importance for a safe labour.

**Analgesia for labour**

When an obese woman is admitted to the labour ward, the attending anaesthetist should be informed if operative intervention is anticipated for delivery. This communication should be documented in the midwifery notes. An anaesthetist of appropriate seniority and experience should be informed and available to provide anaesthetic care of the obese woman during labour and delivery. Secure venous access should be established early in labour and the anaesthetist should discuss and offer early epidural analgesia. The early establishment of epidural analgesia is supported by studies reporting epidural cannulation failure rates of more than one-third in obese parturients.\(^8\) Furthermore, epidural catheter re-sitting rates increase linearly with BMI. Hence, for these reasons, and while the woman is most cooperative, an early epidural is advisable. Well-functioning early epidural analgesia will additionally facilitate a safe anaesthetic in this group of patients in risk of instrumental and operative procedures. Not surprisingly, due to the technical challenges of establishing epidural analgesia in obese parturients, the incidence of dural puncture is significantly increased compared with normal weight mothers—4% compared with 0.5–2.5%, respectively.\(^9\) In addition to established techniques, for example, the parturient sitting in a forward bending position, there is emerging evidence that pre-puncture lumbar ultrasound may be a useful guide to locate landmarks and correctly facilitate the placement of the epidural catheter.

Although the use of opioid analgesia in the obese parturient risks causing maternal drowsiness and hypoventilation, patient-controlled i.v. remifentanil analgesia offers a reasonable alternative if epidural analgesia is contraindicated or has failed. Because of the potential for adverse respiratory effects, supplemental oxygen should be administered and continuous peripheral oxygen saturation monitored during one-to-one midwifery care. The routine use of nitrous oxide/oxygen (entonox, Linde Gas, Munich, Germany) has not been reported to adversely affect outcome in obese parturients. Likewise, the use of transcutaneous electrical nerve stimulation and acupuncture for labour analgesia has not specifically been investigated in groups of obese mothers.

**Anaesthesia for Caesarean section**

Central neuraxial blockade is well established as a safer option than general anaesthesia for Caesarean section. The concomitant decline in maternal deaths due to anaesthesia with the proportional increase in Caesarean sections has been attributed almost entirely to the superior safety record and increased use of regional anaesthesia for elective and emergency Caesarean sections.

**Regional anaesthesia**

Safe and effective regional anaesthesia for Caesarean section is universally achieved by spinal, epidural, or both techniques offering a dense reliable sensory-motor block of rapid onset. The requirement for local anaesthetic is less in obese parturients with the risk of a high spinal block if doses are not tailored to individual patients.

Epidural anaesthesia may be advantageous compared with single-dose spinal anaesthesia due to the ease by which local anaesthetic can be titrated against haemodynamic effects and sensory-motor block. Additionally, the epidural catheter can be used for postoperative analgesia, thus negating the need for opioid pain relief. If time and skills are available, a combined spinal–epidural technique offers the advantages of rapid onset anaesthesia with the ability to accommodate prolonged surgery and postoperative analgesia. Partly due to the often time-extended surgery in the obese population, trials have reported on the use of continuous spinal anaesthesia in obese parturients. Although shown to provide safe and effective anaesthesia for Caesarean section, this technique has not found widespread use.

**General anaesthesia**

Parallel to reports on the superior safety of regional anaesthesia, Caesarean sections performed under general anaesthesia have rapidly declined and constituted in the year of 2008–09 only ~5% of all operative deliveries in England.\(^10\)
Before induction, preoxygenation should be performed in a reversed Trendelenburg position as this extends the time to desaturation during apnoea. A proper assessment of the airway should have been performed during the preanaesthetic assessment and consideration should be given to modify the traditional ‘sniffing the morning air’ intubation position to the ‘ramped’ position. This position is achieved by arranging blankets underneath the patient’s upper body and head until horizontal alignment has been achieved between the external auditory meatus and the sternal notch. The potential for an unanticipated difficult airway requires the anaesthetist to have prior local knowledge and training in the use of aids for difficult intubation and ventilation. Safe general anaesthesia for the obese parturient will often require the assistance from a senior anaesthetist. The complexities of operative procedures and general anaesthesia in the obese, pregnant population are reflected in mortality statistics reporting that 27% of women who died peripartum were obese.11

**Postoperative care**

After operation, obese parturients are at increased risk of hypoxemia, chest infection, wound infection, and deep venous thrombosis. A constellation of early ambulation, venous thromboprophylaxis, chest physiotherapy, and adequate analgesia are required to ensure a safe and effective recovery. The leading cause of maternal death in the UK remains thrombo-embolic episodes.11 Hence, prevention should be vigilantly pursued with recent guidelines,12 recommending that pregnant women with a BMI of $\geq 30$ kg m$^{-2}$, and with two or more risk factors for thrombo-embolism, should be considered for prophylactic low-molecular-weight heparin (LMWH). Prophylactic treatment ought to commence in early pregnancy. Women receiving LMWH during pregnancy should continue prophylactic doses of LMWH until 6 weeks postpartum.

**Conclusion**

With the increased prevalence of obesity among women of child-bearing age, it is important that the anaesthetist involved in maternity services has theoretical and practical knowledge of safely managing this high-risk patient group. Ideally, weight management should be commenced before pregnancy. However, by the time obese parturients first encounter anaesthetic services, it is too late for weight loss therapy. Additionally, the anaesthetist may not be the appropriate health-care professional to advice about weight management and ought instead to focus on delivering a safe, non-judgemental service reducing the risk of morbidity and mortality for the mother and baby.

**Conflict of interest**

None declared.

**References**


Please see multiple choice questions 25–27.