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Obese nulliparas

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INTRODUCTION

Definition and epidemiology

Obesity is a condition in which body weight reaches a level high enough to endanger health. It is most commonly described in terms of body mass index (BMI) kg/m^2, which is the current gold standard measurement of adiposity. The classification into groups is shown in Table 1[1].

In addition to the BMI, a number of other methods are used increasingly in the non-pregnant adult to assess and describe obes ity. For example, waist circumference is widely considered a simple and accurate predictor for type 2 diabetes[2]. An increased waist-to-hip ratio has significant association with myocardial infarction[3] and the metabolic syndrome as well as subfertility[4] and development of gestational diabetes[5]. In contrast, bioimpedence (a measure of the opposition to the flow of electric current through tissues) is an ineffective measure of adiposity. Within obstetrics, the most widely used measurement is BMI.

The prevalence of overweight and obesity is rising throughout the developed, and to some degree, the developing world. The surgeon general of the United States describes it as a greater public health threat than smoking. In the UK, it represents one of the greatest (and growing) overall threats to the childbearing population[6]. Two-thirds of Americans are overweight and, of these, half are obese[6]; in the UK, 25% of adult women are obese[7,8]. In general the increase in obesity prevalence is a phenomenon of the past few decades, although one US study suggests that it now appears to be leveling off, at least in women[9]. Obesity appears to be at least superficially related to social class. Whereas in the mid-19th century the higher socioeconomic groups were at greatest risk, today it is the reverse[8], as lower socioeconomic populations consume an energy-dense and nutrient-poor diet[10]. That having been said, there is a general consensus that dietary content has changed greatly in the past 150 years with great reductions in the daily consumption of fruit, vegetables, breads and grain related products[11].

Table 1 Classifying overweight and obesity[1]

Classification	*BMI*
Healthy weight	18.5–24.9
Overweight	25–29.9
Obese I	30–34.9
Obese II	35–39.9
Obese III	40 or more

HOW DOES OBESITY AFFECT MOTHER AND FETUS?

Conception and miscarriage

Both fertility and maintenance of early pregnancy are affected by obesity. Although it is difficult to differentiate between the effects of obesity and polycystic ovarian syndrome and diabetes, obesity is independently associated with anovulation. This was clearly demonstrated in the large cohort US-based Nurses' Health Study II[12] and other smaller studies[13]. Insulin resistance is likely to be the main contributing factor. Ovarian physiology is altered both by directly increasing ovarian steroidogenesis and by reducing sex hormone-binding globulin synthesis, which leads to higher free androgen levels[14]. Another factor that has been identified as a possible causative agent is a elevated mullerian inhibiting substance, characteristically raised in polycystic ovarian syndrome, but also independently associated with anovulation in obesity[15].

Although anovulation is the main factor causing subfertility in obesity, there are others as well. A high BMI reduces the spontaneous pregnancy rate in both ovulatory women[16], and in women without menstrual irregularities[17] by an unknown mechanism.

Early miscarriage is four times more likely in obese women, although some evidence exists that women with a BMI of 25–30 have no increased risk[18]. Obesity is also a factor in recurrent miscarriages[19,20].

Evidence for the influence of obesity on *in vitro* fertilization outcome is abundant, but conflicting. An increased early miscarriage rate, and a resultant reduced live birth rate are both firmly established[21]. Several large studies show a higher cancellation rate (due to poor ovarian follicle response) with BMI >27[22,23]. Implantation rates and fertilization rates are not significantly reduced[21].

Antenatal complications

Hypertensive disorders of pregnancy

The linear association between weight and hypertension in pregnancy (both systolic and diastolic) is well established[24,25]. In fact, an increased BMI is a stronger risk factor for severe than for mild gestational hypertension[26]. The association between obesity and pre-eclampsia is also indisputable[27,28]. The risk of pre-eclampsia is doubled with a BMI of 26 and tripled with a BMI of 30 compared to a BMI of 21[28]. The same association is not present with the HELLP (hemolysis, elevated liver enzymes, low platelets) syndrome, supporting the hypothesis that the disease mechanisms are different[29]. The pathological processes are not fully understood; however, oxidative stress, inflammation and altered vascular function have been proposed[30]. Increased serum triglycerides are independently correlated with risk of pre-eclampsia[31]. As much as one-third of the effect of BMI on pre-eclampsia may be mediated through triglycerides and inflammation[32]; cholesterol levels may also be similarly correlated[25].

Gestational diabetes

Although the screening criteria for gestational diabetes mellitus (GDM) remain subject to controversy, the role of maternal weight as a risk factor is certain. The correlation between BMI and GDM is direct: a large meta-analysis calculated the odds ratios of developing GDM for overweight, obese and severely obese women as 2.1, 3.6 and 8.6, respectively[33]. Interestingly, however, once a diagnosis of GDM is made, pregnancy outcomes are similar regardless of maternal BMI[34]. Weight gain during pregnancy may also be a significant risk factor for diabetes, as mid-trimester BMI is more predictive than pre-pregnancy BMI[35].

Thromboembolism

Venous thromboembolism (VTE) is the leading cause of direct maternal death in the UK. The incidence in pregnancy is about 85 per 100,000 and two-thirds of these are postnatal. Obesity is a well documented risk factor for VTE. Both BMI >25 and delivery by cesarean section independently almost double the risk of postnatal VTE[36].

Labor and delivery

Obesity increases most risks for labor and delivery. As BMI increases, the chance of spontaneous onset of labor at term decreases[37,38]. When the BMI is >30 the chance of spontaneous labor declines by as much as 50%. Excessive weight gain between the first and third trimesters is also associated with longer gestation[37]. Although the risk of spontaneous preterm labor decreases with increasing BMI, the risk of having a premature baby is increased due to medical intervention[39], as induction of labor is increased, due in part to the increased numbers of postdate pregnancies[38,40], as well as the medical disorders mentioned above.

The association between pre-pregnancy maternal BMI and cesarean section risk is linear, and consistently observed in many cohort studies[37,41,42]. The odds ratio for cesarean delivery is 3.2 when BMI is >30 compared with normal[42]. Not only is BMI an independent factor for cesarean delivery, but it may also have a more significant impact than GDM[43]. Excessive weight gain during pregnancy also acts as a predictor of cesarean delivery independent of pre-pregnancy BMI and diabetic status[44]. The explanation for this increased risk is probably multifactorial, but failure to progress in labor caused by macrosomia and soft tissue dystocia (fat tissue accumulation narrowing the genital tract) has been proposed[45]. Obesity may also impair the ability of the uterus to contract in labor[46], contributing not only to the increased risk of cesarean delivery, but also to prolonged pregnancy duration. Difficulty performing and interpreting tests of fetal well-being such as ultrasonography, cardiotocography and fetal blood sampling may also be contributory.

Anesthetic complications

A number of important issues are related to the administration of anesthesia in the obese, the most important being difficulty of endotracheal intubation (15%) with increased rates of oxygen desaturation[47]. This latter problem is the result of BMI-exacerbated pregnancy-related reduced lung capacity and increased work of breathing. The already overloaded cardiovascular system is further stressed by the physiological changes of pregnancy. The very high demand for cardiac output can result in congestive cardiac failure[48] and the strong association between obesity and hypertension and diabetes increases the risk of ischemic heart disease. Gastro-esophageal reflux is a common problem in pregnancy and is exacerbated by the increased gastric volume and hiatus hernia so commonly found in obese patients[49]. Concomitant with these problems, aspiration under anesthesia is increased. The major alternative to general anesthesia, regional blockade, is technically more difficult due to problems in identifying the midline and epidural space, and subsequent dislodgement of catheters. This combination of factors can result in an initial failure rate of up to 42%[50].

Of the four deaths directly attributed to anesthesia in the UK 2007 CEMACH report[6], two women had BMIs >35; in each case death was caused by airway problems.

On the other side of the coin, some changes associated with pregnancy are actually beneficial to the obese woman. For example, the increased sensitivity of the respiratory center to carbon dioxide protects against obstructive sleep apnea, which is a risk in obese women[48].

Death

Obesity was highlighted as a risk factor for maternal mortality in both the 2004 and 2007 UK CEMACH reports[6,51]. Fifty-two per cent of deaths in the triennium ending 2005 were in overweight women (BMI >25). The most important causes of death amongst the obese are thromboembolism, sepsis and cardiac disease[6]. The same is likely to be true elsewhere in the developed world; however, in no other country is there such a comprehensive national audit on maternal mortality. In fact, only rarely do national-level databases containing information on pre-pregnancy weight even exist.

Postpartum

The adverse delivery and postpartum events associated with obesity such as operative vaginal and abdominal delivery, macrosomia and shoulder dystocia[38] all increase the risk of postpartum hemorrhage. Postpartum anemia is increased independent of hemorrhage[52].

Infectious morbidity is increased from postcesarean wound infections, endomyometritis and urinary tract infections. This relationship remains true for both elective and emergency operations, even when prophylactic antibiotics are administered[53,54].

As pre-pregnancy BMI increases, successful breastfeeding duration shortens. Whether social context is the whole or part of the explanation for this finding is not clear; nor is it clear if this phenomenon is universal or restricted to the Danish study population[55].

Fetus

Birth defects

The association between obesity and fetal neural tube defects (NTDs) is well established. Compared to normal-weight women, offspring of mothers with a BMI of >30 have approximately twice the chance of being affected[56]. Although maternal diabetes is also a risk factor, obesity remains significant after adjustment for this[57]. In addition to NTDs, cardiac malformations more recently were shown to be increased for both the overweight and obese[58]. The association is strongest with atrial and ventricular septal defects[59].

Several mechanisms have been proposed for these associations, though none are confirmed. As hyperinsulinemia is a known independent risk factor for NTDs, one explanation is that many obese women have undiagnosed glucose intolerance. Poor quality diets resulting in nutritional deficits may also be causative.

Macrosomia and shoulder dystocia

It is axiomatic that obese women deliver large babies[40,45,60]. In this regard, maternal BMI exerts an even stronger influence than GDM on this risk[43]. The influence of excess weight gain during pregnancy (defined as 7–11 kg for women with BMI >26) on this risk is interesting. Neither overweight women with normal weight gain, nor normal-weight women with excess weight gain are at risk; risk only accrues to overweight women who gain excess weight. Accordingly, an overweight woman can reduce her chances of delivering a large baby by moderating her weight gain during pregnancy[61].

Shoulder dystocia is an essentially unpredictable event; however, its incidence rises incrementally with increasing birth weight. When GDM is present, the incidence is further increased[62]. This having been said, maternal BMI has not been shown conclusively to be an independent risk factor as evidence on this point is conflicting[38,63,64].

Assessment of fetal well-being

All methods of determining fetal well-being are notoriously difficult in the obese woman.

Excess abdominal adiposity complicates measurement of fundal height, ultrasound visualization of the fetus and cardiotocography (CTG). Fetal blood sampling is also physically more demanding when the woman is heavy. Inevitably, this could lead to failure to recognize fetal compromise with subsequent poor outcome. Despite widespread acceptance of this hypothesis, it has been difficult to prove in clinical trials. Indeed, accuracy of sonographic fetal weight estimation was unaffected by BMI in two studies[65,66]. Regardless, visualization of the cardiac and craniospinal structures is suboptimal[67], and fetal blood sampling takes longer as BMI increases[68].

Stillbirth

The association between increased BMI and stillbirth has been established by meta-analysis showing an incrementally increased risk with increasing BMI[69]. Obese women have double the risk of stillbirth (odds ratio of 2.1)[70]. No single cause of death can explain this risk; however, there are more 'unexplained intrauterine deaths', and fetoplacental dysfunction is more common[71].

Infant

Offspring of obese women are at risk of childhood obesity that continues on into adolescence and perhaps later in life[72,73]. The association is strongest, however, for macrosomic babies[73,74], and there is a strong link between maternal obesity and macrosomia which is not dependent on maternal diabetes mellitus. Perhaps even more concerning is the two-fold increased risk of developing childhood metabolic syndrome (obesity, hypertension, dyslipidemia and glucose intolerance) in infants born to obese women, and those born macrosomic (regardless of maternal diabetic status)[75].

WHAT SHOULD BE DONE TO OPTIMIZE MATERNAL AND FETAL OUTCOME?

Weight loss

How much?

For women seeking fertility treatment, the UK National Institute for Health and Clinical Excellence (NICE) states that a BMI of <30 should be achieved before commencing assisted reproduction, as a BMI >30 is likely to reduce the success of all procedures[76]. In the case of obese anovulatory women, weight loss assists with resumption of ovulation and improves pregnancy rates[77–79]. However, the British Fertility Society recommends that 'Women with a body mass index of <19 and >29 should be referred for advice from a dietician, warned of the risks in pregnancy, if appropriate, and provided with access to exercise advice and offered psychosocial support. NHS funding of their infertility treatment should be deferred until they demonstrate response to these interventions. If the menstrual cycle is regular and the FSH normal, assisted conception may be provided if the BMI is <36.'[80]. As funding for infertility treatment is actually dependent on geographical location within the UK, differing upper BMI limits apply. As assisted conception is funded privately elsewhere in the developed world, other countries do not define strict inclusion criteria. However, the Canadian Fertility and Andrology Society advises a supervized weight loss program if BMI is >30 before referral to infertility services. Preconceptional weight loss is not only practically difficult, but the stipulation to lose weight before attempting assisted conception can exacerbate already significant psychological morbidity.

Barker's hypothesis of 'developmental origins of adult health and disease' states that environmental factors, particularly maternal undernutrition, act in early life to program risks for later life adverse health outcomes[81]. It is postulated that the pituitary–adrenal axis may

be reprogrammed to produce excess glucocorticoids, thus resulting in pathologies such as cardiovascular disease and the metabolic syndrome in adult life. It has been hypothesized that dieting pregnant women may also be at risk of this outcome, though never proven. However, exposure to *in utero* overnutrition, i.e. maternal hyperglycemia can result in poor health outcomes, such as obesity, that emerge in childhood and adolescence[82]. Therefore, it would seem prudent to maintain a balanced diet throughout the preconceptional and early gestational periods with weight loss occurring at a steady pace. The recommended maximum weekly weight loss for obese adults is 0.5–1 kg with the target of losing 5–10% of the original weight. The change from losing weight to maintenance should occur after 6–9 months[1]. These recommendations have not been studied specifically in the preconceptional period. It may be sensible to prescribe vitamin and mineral supplements containing the reference quantities if significant weight loss is occurring.

Once pregnancy has begun, the recommended weight gained is dependent on a woman's pre-pregnancy BMI. The Institute of Medicine in 1990 produced a report titled 'Nutrition during pregnancy' which advises that weight gain for pregnancies should be inversely correlated to pre-pregnancy BMI (Table 2)[83,90]: these figures have since been ratified by prospective data[84]. In terms of obese women, weight gain of less than 7 kg has no negative impact on pregnancy or neonatal outcome[85]. On the contrary, a recent Missouri population-based cohort study described reduced risks of pre-eclampsia, cesarean section and macrosomia in obese women who lost less than the recommended 7 kg during pregnancy[86]. We also know that gaining more than 7 kg during pregnancy results in a two- to three-fold further increase in weight retention postpartum[87]. This is particularly significant for the nulliparous woman who, with each successive pregnancy, will have increasing pre-pregnancy BMI with its associated increased risks.

Table 2 Recommended total weight gain ranges for pregnant women with singletons by pre-pregnancy BMI[90]

BMI	*Recommended weight gain* (kg)
Low (BMI <19.8)	12.5–18
Normal (BMI 19.8–26.0)	11.5–16
High (BMI >26.0–29.0)	7–11.5
Very high (BMI >29)	>6.8

Strategies

The UK national guideline on management of obesity in non-pregnant adults offers a template for deciding the initial level of intervention required according to the woman's BMI and waist circumference (Table 3)[1]. The US National Institutes of Health's guideline on the treatment of overweight and obesity in adults advises the use of pharmacological strategies in patients with a BMI >30 or >27 with concomitant risk factors, and surgery for patients with a BMI >40 or >35 with comorbid conditions and acceptable operative risks[88]. Applying this to the preconceptional situation is considered below.

Conservative

Within the context of a preconceptional counseling session, physicians should ensure that an extended consultation is booked so that the many risks outlined above can be discussed, the extent of detail being tailored to the patient's understanding. In some instances, the presentation of this information alone can initiate motivation to lose weight. However, due to lack of time, resources and knowledge[89], clinicians often are poor counselors, so much so that obesity management training for the

Table 3 A guide to determining the initial level of intervention to consider[1]

	Waist circumference			
BMI	*<80 cm*	*80–88 cm*	*>88 cm*	*Comorbidities present*
25–29.9	Advice	Conservative	Conservative	Medical
30–34.9	Conservative	Conservative	Conservative	Medical
35–39.9	Medical	Medical	Medical	?Surgical
40 or more	?Surgical	?Surgical	?Surgical	?Surgical

clinician may be warranted[90]. Other than informing the woman of the risks, the consultation should include a discussion about why they have gained weight as well as their diet and activity levels. Admittedly, individuals from various ethnic and socioeconomic backgrounds may be at greater risk from obesity and may have different attitudes and beliefs about weight management. Weight loss strategies previously used should be reviewed and an assessment of the patient's readiness to change should be made[1].

Group weight loss programs involving both exercise and dietary advice have a far greater impact on weight loss compared to the standard clinical approach[91–93]. This is particularly true for obese infertile women who are more likely to conceive and less likely to miscarry if they are participating in a group program than operating as an individual[94]. Accordingly, information about local patient support programs should be readily available.

Exercise should be encouraged for both weight loss and other health benefits; targets should be realistic. Activities that can be incorporated into everyday life will be better adhered to. The UK recommended level of activity for overweight adults is 30 minutes of moderate-intensity activity, e.g. brisk walking or cycling on five or more days a week. This level of activity is also perfectly safe in pregnancy, so any fears that this could harm an early pregnancy can be dispelled[95].

Medical

Currently, two commonly used pharmacological interventions facilitate weight loss: appetite suppressants (sibutramine, rimonabant); and lipase inhibitors (orlistat). Medical treatment should always be used in combination with the conservative measures outlined above. All medical treatments are contraindicated in pregnancy but data are scant; therefore contraception is imperative during therapy. Meta-analyses assessing the efficacy and safety of these drugs have shown them all to be superior to placebo, but weight loss is only moderate (less than 5 kg more than placebo), and drop-out rates are very high. Moreover, no long-term data are available on their eventual effect on cardiovascular morbidity[96,97], though this health benefit may be more significant than the weight loss itself to the preconceptional woman, as its impact on her future fertility, pregnancies or offspring is doubtful.

The choice of drug can be steered by the patient's preference, local drug costs and the patient's comorbidities. Rimonabant is the most effective for weight loss, improves blood pressure and triglyceride levels, and increases high density lipoprotein levels. However, psychiatric disorders are increased and rimonabant should be avoided in women with any psychiatric history. Sibutramine also improves triglyceride levels and increases high density lipoprotein concentrations; however,

blood pressure and pulse are increased. Pre-existing cardiovascular disease, uncontrolled hypertension and tachycardia are therefore contraindications. Orlistat is the least effective for weight loss, but the secondary benefits are significant, including a reduced incidence of type II diabetes (shown in one 4 year trial)[98], and reductions in blood pressure, fasting glucose and hemoglobin A_{1C} concentrations in patients with diabetes, as well as total cholesterol and low density lipoprotein concentrations. There is, however, a 15–30% rate of gastrointestinal adverse effects, and due to its malabsorptive mechanisms, patients are usually advised to take mulitvitamins on a daily basis, even though clinically relevant vitamin deficiency has not been reported[96].

Surgical

Obesity surgery is an option for the obese who have failed conservative and medical treatment. Postoperative weight loss is far in excess of that which medical or conservative therapy can offer. A mean loss of over 60% can be expected for the morbidly obese with resolution of comorbidities including diabetes, hyperlipidemia, hypertension and obstructive sleep apnea in the majority of patients[99]. The American College of Obstetrics and Gynecology (ACOG) recognizes bariatric surgery as suitable treatment in the preconceptional woman[100]. Neither the Royal College of Obstetricians and Gynaecologists (RCOG) nor the Society of Obstetricians and Gynaecologists of Canada (SOGC) have made statements regarding surgery for the preconceptional woman.

Procedures are either restrictive (gastric banding) (commonest in the UK), malabsorptive (gastric bypass) or hybrid (biliopancreatic diversion). The description of these operations is beyond the scope of this chapter, although, it is worthwhile understanding the mechanisms and common complications so that patients can be informed. Restrictive procedures work by limiting the amount of solid food that can be ingested at any one time. The patient should chew well and eat slowly, or vomiting can result. Weight loss is achieved mainly through an unpleasant sense of fullness. Malabsorptive procedures cause the stomach to have very limited digestive capacity, exposing the lower gut to undigested nutrients. This gives rise to satiating signals, and diarrhea is a common side-effect.

The conventional indication for surgery has been a BMI >40 or BMI >35 with comorbidities. Increasingly, studies are looking at operating on women with a BMI of 30–35[101,102] owing perhaps to the impressive results and improving safety profile accompanying laparoscopic operations. UK guidelines recommend that a candidate should have tried all appropriate non-surgical measures for at least 6 months, be generally fit for anesthesia and surgery, and be committed to long-term follow-up[1].

The risk of fetal undernutrition is the greatest concern for preconceptional women contemplating surgery. Nutrient complications are much less likely with restrictive than with malabsorptive procedures, and can be prevented with monitoring, dietary advice and supplementation. Macronutrient deficiencies include protein-calorie malnutrition and fat malabsorption; and the commonest micronutrient deficits are iron, calcium, folate and vitamin B12[103].

After bariatric surgery the benefits of weight loss on pregnancy are great and certainly seem to outweigh any potential adverse effects. Conception rates improve, though the miscarriage rate has not been shown to decrease[104]. Early concerns about increased rates of preterm birth and intrauterine growth restriction have not been verified with larger studies. In fact, not only is there good evidence showing that perinatal outcome is not adversely affected[105–107], but pregnancy complications such as hypertensive disorders, gestational diabetes and macrosomia are also significantly reduced compared to non-surgically treated obese women[104,108,109].

The adjustability of gastric bands (enabled via a small access port positioned under the skin) makes them an attractive option for preconceptional women, as it allows modification of the sphincter size as the requirements change through the pregnancy. During the first trimester, for example, it can be loosened if hyperemesis is a feature. A group in Australia have shown that 'active management' of the band in pregnancy has enabled many women to achieve the Institute of Medicine (IOM) recommended weight gain[106]. However, there are not as yet established guidelines on the management of a gastric band in pregnancy.

ACOG has made recommendations concerning women who have undergone bariatric surgery before commencing pregnancy[100]. Women should be advised that they are at risk of becoming pregnant unexpectedly following surgery and should delay pregnancy for 12–18 months to avoid conceiving during the rapid weight loss phase. Theoretically, this will promote optimal maternal condition as well as avoid potential nutritional deficiencies; however, evidence supporting this admonition is minimal and inconclusive[104,107,110].

General measures

Inherent in any preconceptional weight reduction program is the need for good contraception so that the target weight can be achieved before pregnancy begins; the obvious choice is a barrier method. The reasons for this include the elevated thromboembolic risk with the combined oral contraceptive, the delay in return of fertility with depot injectables, the reduced efficacy with progesterone only pills (POP) and risk of pelvic inflammatory disease with intrauterine devices. In addition, the progesterone implant can be considered, as failures attributable to BMI have not occurred, and the desogestrel POP which acts to inhibit ovulation is likely to be unaffected by BMI[111].

It is imperative that obese women are strongly advised to take folic acid supplementation as they are not only at a heightened risk of fetal neural tube defects, but have also been shown to be less reliable medicators[112]. The question of high dose supplementation of the obese has not been answered, but the RCOG recommendation is to 'consider high-dose folic acid (5 mg/day)' in severely obese women (BMI >35) (consensus views 53rd study group). Some evidence supports this. For example, one study showed that the usual dose of 400 μg had no protective effect for women weighing over 70 kg[113]. In addition, a Canadian study demonstrated that flour fortification only benefited lighter women and not the heavier, by calculating odds ratios for the risk of maternal obesity on NTDs before and after flour fortification was introduced (OR 1.4 versus 2.8). This could mean that obese women require higher doses, but could also mean that the increased risk of NTDs is independent of folate intake[114].

Vitamin D deficiency can occur during periods of high demand including intrauterine life, infancy, childhood and pregnancy. As 90% of vitamin D is synthesized in the skin by exposure to sunlight, considerable variations occur secondary to geographical latitude and skin color. It is well documented that obese individuals have lower vitamin D levels[115,116], the mechanisms for this being partly vitamin D's accumulation in fat cells and possibly a reduced production. Because there is a direct correlation between maternal and neonatal vitamin D deficiency[117] it follows that increased vitamin D levels in the pregnant woman will benefit the child. In addition, improved vitamin D status in the mother reduces the risk of childhood osteoporotic fracture and wheeze[118,119]. NICE now recommends vitamin D supplementation of 10 μg/day to all pregnant women with a BMI >30[120]. It would be worthwhile and without risk to start vitamin D in the pre-pregnancy period so that levels can accumulate.

CONCLUSION

The management of obesity has long been poorly understood and, as a consequence, the condition has been largely ignored. The subject can be difficult to broach and requires sensitivity on the part of the clinician, but its significance must not be underestimated. Active management can reap great benefits to the patient, and even greater benefits to the preconceptional patient.

The main obstacle to achieving good preconceptional care of obese women is logistical. These women do not present to the medical profession unless there are comorbidities or fertility problems. However, these opportunities should not be missed, and systems need to be put into place in medical and fertility clinics to ensure preconceptional counseling can take place. The ACOG Committee Opinion on preconception care recommends 'screening of all reproductively capable women on an ongoing basis to identify potential maternal and fetal risks to pregnancy'[121]. Medical practitioners should take opportunities wherever possible to ask women about their intentions for pregnancy so that counseling can be arranged in good time.

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