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Review

Pregnancy in underweight women: implications, management and outcomes

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Key Content

- Despite attention on obesity in pregnancy, within the UK and globally, many women enter pregnancy underweight. There remains a paucity of evidence-based guidance on the optimal care of these women.
- Maternal underweight is associated with low birthweight and preterm birth, both spontaneous and iatrogenic, but appropriate gestational weight gain may mitigate low body mass index (BMI).
- Although being underweight may be protective against several antenatal and intrapartum complications, low BMI can be related to underlying organic disease and/or eating disorders, or there may be modifiable lifestyle factors that should be addressed in pregnancy.
- BMI at booking should assist as a screening tool. Body image, genetic, socioeconomic and cultural factors may affect BMI, making underweight women a heterogeneous group requiring individualised assessment.

Learning Objectives

- To understand the associations of low BMI in pregnancy and its impact on maternal and fetal outcomes.
- To understand the antenatal care of underweight women, including nutritional advice and when additional fetal surveillance is required.
- To understand the heterogeneity of underlying causes of low BMI in pregnancy and the importance of gestational weight gain.

Ethical Issues

- Beware making assumptions about different ethnicities that will interfere with offering the most appropriate care.
- Low BMI that is not managed as a risk issue during pregnancy is an avoidable cause of low birthweight and preterm birth.
- Women presenting with low BMI may have features in their history, such as certain mental health disorders, that mean they should be referred for safeguarding as a vulnerable adult. The unborn child and other children may also need assessment.

Keywords: comorbidities / low BMI / pregnancy and anorexia / pregnancy and pre-term delivery / underweight women

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Introduction

Despite the obesity epidemic, within the UK and globally, many women enter pregnancy underweight. Maternal underweight can be defined as having a body mass index (BMI) of <18.5 kg/m^2 at the start of pregnancy. A low BMI may be 'normal' for the individual, but it could be associated with underlying organic disease, psychiatric illness or socioeconomic and lifestyle factors, which may need addressing during the course of a pregnancy. While being underweight can be protective against several antenatal and intrapartum complications, it is associated with maternal and fetal adverse outcomes, including low birthweight and prematurity. Despite this, there remains a paucity of evidence-based guidance on the optimal care of these women. Guidance published by the National Institute of Health and Care Excellence (NICE) on weight management before, during and after pregnancy[1] specifically excludes women with a BMI of less than 18.5 kg/m^2.

Epidemiology

Approximately 3–4% of women in the UK enter pregnancy underweight.[2] However, worldwide, the burden of malnutrition lies in low- and middle-income countries. For example, up to 30% of women of reproductive age, in most countries in Sub-Saharan Africa, are underweight. Body image, genetic, socioeconomic and cultural factors affect BMI, making underweight women a heterogeneous group. However, large cohort data sets have indicated that underweight pregnant women tend to be significantly younger, single, in education, and not in paid employment. In addition, there is evidence to suggest the prevalence of smoking is higher in underweight women.[2] In an American

cohort study,[3] being underweight pre-pregnancy was highly correlated with ethnicity. The study describes a disparity of maternal underweight of 8.6% in the Asian population and 1.9% in the Black American population, drawing into question the validity of BMI as a measure of wellbeing, across a multi-ethnic population.

The prevalence of the eating disorders (EDs) anorexia nervosa (AN), bulimia nervosa (BN) and binge eating disorder (BED) in the nonpregnant population has been suggested as 9.2%, falling to between 5.1% and 7.5% during pregnancy.[4] Women with AN are most likely to be associated with low booking BMI, while women with BN and BED often have a BMI within the normal range or higher and may be less likely to be detected during pregnancy.

Body mass index

BMI is the commonest surrogate marker of nutritional status in studies of pregnancy. BMI was conceived as a tool for estimating body fat percentage. The ideal BMI range of 18.5–25 kg/m^2 is itself based on the evidence of lower, all-cause mortality in this group. Bhaskaran et al. (2018)[5] analysed mortality data from over 3.6 million UK cases and found the lowest mortality in the BMI range 21–25. They noted that while the greatest risk was associated with class 2 obesity and above, the projected life expectancy at age 40 for BMI <18.5 was 4.3 years lower than for those with a healthy weight. Arguably, for an Asian population, the normal BMI range (19–25 in adults) should be lower. This would have the effect of reclassifying Asian people with lower BMI as 'normal' and higher BMI as 'overweight'.[6] It may also contribute to missing pathology affecting weight within the Asian population, because lower BMI is assumed to be normal.

The construct of BMI is unable to describe the cause of a low BMI. Any individual can be under weight for various reasons; for some it will represent their 'normal' genetic potential, whereas for others it will be the result of a pathological process such as malnutrition, hyperemesis, EDs or chronic illness. Many authors have drawn attention to the different confounding factors associated with extremes of BMI in different communities, including socioeconomic factors.[2,7]

Causes of low body mass index

Table 1 summarises the causes of low BMI.

In the initial assessment, treatable causes of low BMI should be excluded before arriving at a determination of an idiopathic low BMI. Do not assume that because someone is oriental or of Asian ethnicity, a BMI less than 19 is normal; this may miss the fact that EDs and other morbid states relating to low BMI occur in these populations too.

Gastrointestinal conditions leading to malabsorption, such as inflammatory bowel disease, or conditions associated with chronic inflammation, such as inflammatory arthropathies, are not uncommon in the pregnant population and may coexist with low BMI.

Severe hyperemesis gravidarum often causes weight loss and poor weight gain and may be particularly detrimental in individuals who already have low starting body weight.[8] It can also be difficult to distinguish between vomiting in early pregnancy and symptoms of ED. Inadequate nutritional intake is – of course – essential to address and the involvement of dieticians can be useful. Appropriate nutritional supplementation with thiamine and other vitamins should also be considered.

The prevalence of ED is steadily increasing and (despite common belief) female sufferers can conceive. For many women, pregnancy confers some protection from the effects of the condition. Poorer pregnancy outcomes have been reported in women with AN and specialised support should be provided through an ED service, if relapse of symptoms occurs during pregnancy.[9]

BMI usually reflects a combination of genetic potential and environmental exposure. Yates et al. (2013)[10] used data from population databases in Utah to analyse the rates of low BMI phenotype among individuals with low BMI relatives. They found a relative risk (RR) of 2.21 (95% confidence interval [CI] 2.13–2.28) for adults with BMI <18.5 with a first-degree relative with low BMI, with a slightly stronger association in the age range 25–65 years (RR 2.57, 95% CI 2.42–2.72).

The relationship between BMI and socioeconomic factors is complex. In poorer countries, low BMI has predominantly been considered a marker of poverty and undernutrition, while in richer countries there is an association between lower socioeconomic status and raised BMI.[11] This association does not represent a linear cause, however, as high BMI for women has been presented as a cause, rather than the result, of lower socioeconomic status.[11] While a healthy BMI has been associated with higher socioeconomic status, in their analysis of the UK population Bhaskaran et al.[5] did not find an association between low BMI (<18.5) and socioeconomic status.

Neonatal outcomes

Pregnancy places increased metabolic demands on the mother; therefore, maternal nutritional status is thought to be important in fetal growth. The Dutch famine cohort study[12] demonstrated that periods of starvation in pregnancy result in an increase in low-birthweight (LBW) babies (<2500 g). The Barker hypothesis (1995)[13] argued that these effects have enduring implications for the future cardiovascular and metabolic health of the individual. Extremes of bodyweight are therefore considered to be risk factors for negative fetal

Table 1. Causes of low BMI

Cause of low BMI	Potential effects on pregnancy	Pregnancy effect on underlying cause	Assessment
Constitutional (normal)	Consider risk of growth restriction and preterm delivery	Should gain weight normally Positive effect and body image	Refer to obstetrician Assess nutritional status, e.g. fat distribution and appearance Assess eating habits Assess mental state and wellbeing Consider bloods for nutritional screen. Consider growth scans
Malnutrition	Increased risk of fetal growth restriction Preterm delivery	Anaemia – mixed pattern Inadequate weight gain	Regular blood counts to assess for anaemia Ferritin, B12 and folate levels if haemoglobin falls to provide adequate and appropriate replacement Refer to dietician Consider fortified drinks and multivitamins Screen for vitamin D deficiency and provide appropriate supplementation Weigh at regular intervals during pregnancy to confirm weight gain Growth scans
Eating disorder	Growth restriction risk Potential risk of microcephaly in toddlers	All the associations with malnutrition, observe for ketonuria and consider renal and liver profiles if a suspicion of laxative abuse or forced emesis suspected Higher risk of osteopaenia Risk of hypokalaemic alkalosis with acute kidney injury if severe purging and forced emesis.	Regular weighing during pregnancy Growth scans Consider referral to eating disorder specialist or perinatal mental health team Dietician referral and nutritional supplementation Refer to for anaesthetic review Ensure drug doses are adjusted, depending on weight at the time of prescribing Refer and recommend bone scan once breastfeeding complete Communicate concerns with GP
Consider malignancy	Possible growth restriction Iatrogenic preterm delivery	Advanced disease if treatment not considered or declined because of pregnancy Difficulty investigating and managing malignancy	Full blood count, renal and liver profiles Tumour markers depending on suspected malignancy Ultrasound/CT/MRI/PET scanning Multidisciplinary team and specialist surgical/oncology involvement
Uncontrolled hyperthyroidism	FGR, IUD, PET Miscarriage Preterm labour/ delivery		Treat in conjunction with maternal medicine or endocrine specialist Growth scans

Abbreviations: CT = computed tomography; FGR = fetal growth restriction; IUD = intrauterine death; MRI = magnetic resonance imaging; PET = positron emission tomography

outcomes, with implications far into adulthood. It is recognised that fetal outcome follows a U-shaped curve with respect to maternal BMI, with a BMI between 20 and 25 being associated with the lowest risk of complications.

The most consistently reported effect of low maternal BMI in the literature is an increased prevalence of LBW babies and late prematurity (34–37 weeks of gestation). In a large systematic review published in 2011, Han et al. (2011)[7] analysed data from over 1 million pregnancies in both developed and developing countries. They reported a statistically significant increase in LBW, in both developed and developing countries (RR 1.48, 95% CI 1.29–1.68, and R 1.52, 95% CI 1.25–1.85, respectively). Interestingly, the association with preterm birth was only statistically significant in developed countries. This could be globally significant as most preterm births occur in developing countries and prematurity is responsible for most early neonatal deaths. Robillard et al. (2018)[14] published an observational cohort study of nearly 60 000 term pregnancies in Réunion and argued that, within the normal

BMI range of 19–25, the appropriate number of neonates were born as either large or small for gestational age. With increasing BMI, the number of larger babies increases, and with lower starting BMI, there are higher rates of low birthweight babies. In 2013, Jeric et al. (2013)[15] presented data showing that, on average, babies born to women with a BMI <18.5 weighed 163 g less. However, the authors make no comment on whether these babies were growth restricted, small for gestational age (SGA) or born prematurely.

Knight-Agarwal et al. (2016)[16] presented data from Australia, which associated low BMI with a higher risk of LBW and late preterm delivery, but without any increase in neonatal morbidity. Sebire et al. (2001)[17] published a retrospective population study based on maternity records in northwest London of 200 000 pregnancies. They found an increase in LBW and late prematurity, but noted that the data do not allow adequate analysis of potential confounders, such as socioeconomic status and smoking. Sebire et al.[17] also discuss the clinical significance of this increase in LBW. The observed shift in a normal distribution of fetal birthweight to the left, they argue, probably represents a higher rate of constitutionally small babies rather than growth restriction: "[this shift in the normal distribution] suggests that intrinsic maternal control of fetal size correlating with maternal size occurs in such pregnancies, rather than a higher prevalence of utero-placental insufficiency resulting in intrauterine growth restriction".

Williams et al. (2010)[18] demonstrated a reduction in stillbirth risk with low BMI mothers, correlating with a reduction in the number of missed cases of fetal growth restriction. This perhaps intimates that increased surveillance in this group of women might protect against the risk fetal growth restriction and, crucially, if growth restriction were to occur in pregnancy, it is less likely to be missed. These considerations are important if screening is instituted based on low BMI as a risk factor.

Healthy weight

Several papers have challenged the association between LBW and prematurity.[19,20] It has been suggested that gestational weight gain is a better marker of adaptation to the demands of pregnancy than BMI in isolation. Zanardo et al. (2016)[21] showed that pregnant women with normal gestational weight gain (as defined by guidance published in 2009 by the Institute of Medicine),[22] there was no increase in LBW but a reduction in both fetal macrosomia and various maternal complications. If low BMI is the consequence of chronic malnutrition caused by poverty, then the mother is less likely to gain adequate weight during the pregnancy because of the continuing stresses of her environment. The inclusion of gestational weight gain is another method for separating cases of 'healthy' low BMI women from those who have a low BMI caused by malnutrition or disease. This challenges the current practice of not routinely weighing pregnant women, at least at the extremes of the BMI range. Perhaps monthly weighing for these groups of women should be considered.

In addition to LBW and late prematurity, there is some evidence to suggest that suboptimal gestational weight gain or a low BMI elevates the risk of placental abruption. For fetal development, some cohort work has suggested an association between a low BMI and risk of atrial septal defect, isolated congenital diaphragmatic hernia and gastroschisis.[23,24] Neither causality nor the potential aetiology of these associations has been established.

Most studies[7,21] show a small but significant tendency for women with a lower pre-pregnancy BMI to have smaller babies and late preterm deliveries. However, most of these studies acknowledge difficulties in accounting for the effect of confounders associated with low BMI, particularly socioeconomic status. The value of BMI in Asian populations has been challenged and analysis of low BMI women in exclusively Asian subgroups has not shown the same associations as in other groups. The concept of a constitutionally low BMI, rather than a BMI that is inappropriately low because of a secondary cause, is also important in terms of stratifying risk. The 2009 Institute of Medicine (IOM) recommendations on weight gain during pregnancy[22] provide an adjunct for assessing adequate nutritional status during pregnancy, rather than relying on just pre-pregnancy BMI.

Guidance published in 2013 by the Royal College of Obstetricians and Gynaecologists (RCOG) on SGA[25] recognises BMI <20 as a minor risk factor for SGA, but considers the effect on size to be the same as being overweight and less than that of being obese.

Maternal implications and associations

Women with a low BMI are not a homogeneous group and being underweight may reduce the risk of various antenatal and intrapartum complications.

Antenatally, women with a low BMI are less likely to develop gestational hypertension, pre-eclampsia and gestational diabetes.[2,17] They are also less likely to deliver large-for-gestational-age babies and are significantly less likely to need delivery by caesarean section (whether emergency or elective). There is some evidence that postpartum haemorrhage rates are lower, as are rates of instrumental deliveries. Conversely, tocophobia may be part of the underlying reason why a woman with low BMI might request a caesarean delivery.

Antenatal anaemia appears to be commoner in this group;[17] there is also evidence that underweight women are at higher risk of obstetric anal sphincter injuries (OASI),

although this is not uniformly seen in all cohorts. Underweight women also have an increased number of admissions in pregnancy (compared with women of normal weight), but fewer admissions than obese women.

Change in body shape and weight gain in pregnancy may trigger relapse for ED. Cohort studies have shown trends towards an increase in relapse of ED postpartum, especially in the first 6 months. This group of women is also at higher risk of postpartum depression and obsessive-compulsive disorder.

Management

General considerations

Management of underweight women in pregnancy should be holistic and guided by the underlying aetiology of the low BMI. The BMI at booking should be used as part of the screen to stratify a woman's risk and to determine the type of care she and her baby will need throughout the pregnancy and beyond.

Where there is an organic cause for being underweight, the appropriate multidisciplinary team (MDT) should be involved, with the obstetrician and midwife working with the teams to provide the best pregnancy outcome.

Appropriate gestational weight gain is important for good fetal outcomes in underweight women. However, in the absence of any randomised clinical trial (RCT) evidence of a beneficial effect on pregnancy outcomes, NICE guidance[1] suggests that repeated weight measurements during pregnancy should be confined to circumstances in which clinical management is likely to be influenced.

There is debate about the application of the IOM guidelines[22] on appropriate gestational weight gain to a multi-ethnic population. The guidelines advise an increased gestational weight gain of 12.5–18 kg for underweight women compared with 11.5–16 kg for normal weight women and 5–9 kg for obese women.[1]

Nutritional advice

Individual energy requirements during pregnancy vary greatly, so it is difficult to stipulate a rigid calorie intake. However, dieticians usually recommend an extra 200 kcal each day in the third trimester of pregnancy for all women.[26] Advice on gaining weight safely includes the use of healthy high calorie foods such as porridge, nuts and whole milk. This should be given alongside standard advice on what constitutes a healthy diet, including basing meals on starchy carbohydrates, the need for five portions of fruits and vegetables per day, with adequate daily protein intake. Consideration needs to be given to iron, folic acid, vitamin D and calcium supplementation, as with all pregnant women. Additional supplementation of micronutrients is not usually required and should be dietician-led. Carbohydrate-rich supplements had surprisingly modest effects on increasing birthweight (less than 100 g in all but one study).[19] Women with very low BMI may benefit from dietician review and a prescription of fortified drinks.

Fetal surveillance

Given the association with LBW babies, consideration of additional fetal monitoring is warranted. RCOG guidance[25] views BMI <20 as a minor risk factor for an SGA baby and, in isolation, would not recommend additional growth scans. However, it may be pragmatic to consider additional growth scans if the BMI was <19, given the wider clinical context. Certainly, concerns about poor gestational weight gain would suggest a benefit of increased fetal surveillance.

Management of women with eating disorders

Pre-conception counselling should ideally be offered to women with ED. Women with active EDs should be treated and in remission before seeking to become pregnant.

Enquiry should be made about the use of appetite suppressants, laxatives or diuretics, which may be harmful in pregnancy. EDs can go undetected in primary care and women with ED may be reluctant to disclose symptoms to healthcare providers. The first antenatal visit or obstetric appointment is an opportunity to screen for their presence, so obstetricians should be aware of the signs suggestive of an underlying ED. In addition to a low BMI, difficulties conceiving related to oligomenorrhoea or amenorrhoea, a lack of weight gain, hyperemesis or psychological problems might raise suspicion of an underlying ED. Physical examination may further help to differentiate a constitutionally thin, healthy woman from one with an underlying ED. Signs may include nail damage or calluses across finger joints from induced vomiting, thinning of hair or fine facial hair (lanugo), dental problems including enamel erosion, and dry skin. Parotid enlargement ('hamster sign') can also suggest self-induced vomiting.

Ideally, women with a suspected or disclosed ED should book with an obstetrician with an interest in EDs and be referred early to a specialist ED service. Liaison for this can often take place through the local perinatal mental health team.

It is essential to discuss with the woman how she is responding to her pregnancy and her thoughts about the effect that pregnancy weight gain may have, and does have, on her, as an assessment for body dysmorphic disorder (BDD). Early education is required on expected body shape changes and the importance of ensuring adequate nutrient intake for fetal wellbeing. Ceasing harmful behaviours, such as binge eating, self-induced vomiting, laxative use and excessive exercise should be encouraged and supported. In addition, should psychological therapy be required, referrals should be dealt with quickly, during pregnancy.

Advice on portion size, having regular structured meals and not missing breakfast may be required. Longitudinal work in women with ED has found an increase in anaemia associated with deficiencies in vitamin and mineral intake, so additional nutritional supplements should be considered, depending on the anaemia and nutritional screen.

Women with a dual diagnosis

Pregnant women with an ED who have a dual diagnosis, such as a coexisting substance misuse disorder or other mental illness, present additional management challenges.

Frequently encountered comorbidities include depression, anxiety disorder and obsessive-compulsive disorder, alcohol and substance misuse. It is therefore extremely important to ensure that appropriate note is taken of the Whooley questions[27] for these women as a screening tool for accompanying mood disorders. The use of the AUDIT-C alcohol screening tool[28] may also be indicated from the history and presentation.

Rates of substance misuse in individuals with EDs can be as high as 50%. There is a clear need to screen and, if substance misuse is suspected, consent should be sought from the woman for urine toxicology or hair strand testing.

Women with a dual diagnosis have poorer treatment outcomes, increased complications, longer recovery times and higher relapse rates.[29] Caffeine, stimulants including amphetamines, laxatives, and thyroid medication may be used for appetite suppression, to aid weight loss or provide energy. In addition, alcohol and other psychoactive substances may be used for emotional regulation or in the context of impulsive behaviours. Although the literature suggests separate aetiologies for ED and substance misuse disorders, any shared common risk factors should be explored; for example, traumatic childhood experiences.

Dual diagnosis may also include BDD, a condition in which the sufferer considers part or all of their body to be flawed, leading to anxiety and behaviours that focus on the perceived flaw. This presentation would warrant referral to the perinatal mental health service for further psychological input and management with psychological support or medication – often antidepressants.

Common to these disorders is potential resistance to treatment and a reluctance to divulge symptoms because of feelings of guilt or shame. Obstetricians and midwives must be prepared to ask difficult questions and be open to explore these issues without judgement.

Other management challenges can include which service to lead care (for example, substance misuse agencies or perinatal mental health). Effective communication between members of the multidisciplinary team is crucial.

Tocophobia may present as part of this constellation of symptoms. This psychological comorbidity should be managed with appropriate psychological input and requires careful handling. Elective caesarean section is not necessarily the most appropriate treatment and individualised assessment and management is key in these cases.

There is very limited good-quality evidence in management approaches for comorbid disorders. However, current literature suggests that the disorders should be treated simultaneously, addressing underlying factors that are common to both, such as difficulties with emotional regulation (personality disorder), through a multidisciplinary approach.[30] Treatment may need to involve medical stabilisation in cases of severe ED, concurrently with psychological treatments including cognitive behavioural therapy (CBT) and psycho-education. Antidepressants may have a limited role and should not be used in isolation.[27]

An extreme manifestation of AN can be hypokalaemic, alkalotic renal failure, related to forced emesis accompanied by laxative misuse. This will require MDT management with appropriate physician input as well as the ED team.

Investigations

Table 2 summarises the investigations that may be required for low BMI.

Table 2. Investigations for low BMI

Parameter	Investigations
Baseline tests for low BMI	Full blood count, renal profile, bone profile, liver profile
In presence of anaemia (haemoglobin <105 g/L)	Ferritin, vitamin B12, folic acid (methyl malonic acid)
Low threshold	Vitamin D assay
Low potassium	ECG ± chest X-ray – risk of cardiac arrhythmia
BMI <19	Consider regular weight minimum once each trimester or monthly
Urinalysis	Ketonuria may suggest purging and forced emesis or starvation
Arterial or venous blood gas	Look for alkalosis, high pH and low potassium
Postnatal bone scan	Consider suggesting this to GP beyond 3 months postnatal to assess bone density and risk of continuing osteopaenia/osteoporosis

Abbreviations: BMI = body mass index; ECG = electrocardiography; GP = general practitioner

Weight loss in pregnancy

Very occasionally, true weight loss is seen during pregnancy; however, this is very rare, even with women with ED. Weight loss can occur as part of the somatic signs and symptoms of depression, but organic causes should be excluded. With the reproductive age shifting to the higher end of the range, investigations to exclude cancer in pregnancy may be necessary. Stage 4 bowel cancer can occur in women of normal reproductive age and has been described during pregnancy.

Other chronic conditions associated with weight loss, for example, inflammatory bowel disease (IBD), can present for the first time in pregnancy.

Safeguarding

Depending on the aetiology, women with a low BMI may be vulnerable adults who will require additional input from safeguarding teams and social care to ensure that they and their unborn children are protected from abuse, harm or neglect. An appropriate level of enquiry is needed to determine the wider socioeconomic context of their pregnancy. For example, a pregnant woman with housing issues might not have anywhere to cook. Women with limited access to their own financial means, perhaps because of unemployment, poverty or in the context of abusive relationships, might find it difficult to buy food. In the UK, 'Healthy Start' vouchers are available to all pregnant women under the age of 18 and to those over 18 who are in receipt of state benefits. These can be spent on milk, fruit or vegetables. Healthy Start vitamins for pregnant women (containing folic acid and vitamins C and D) are also available. Women with limited access to healthcare because of immigration status or language barriers also represent a vulnerable population requiring additional input to ensure their nutritional needs are met. These may be overlooked if it is assumed that their low BMI is associated with ethnic origin; indeed, this can be considered a form of systematic racism.

Postnatal care

Table 3 summarises the care that should be given to women with low BMI postpartum.

Conclusions

Women with a low BMI are a complex, heterogeneous group. Booking BMI should be considered a screen for organic disease, EDs and other mental health issues, and used to highlight women requiring additional, or multidisciplinary antenatal care, related to their complexity. An appropriate level of enquiry into the socioeconomic context of their pregnancy is essential.

While there is risk associated with low birthweight, appropriate gestational weight gain may be more important

Table 3. Postnatal care

Presentation	Expected neonatal birthweight	Level of postnatal care
Low booking BMI but appropriate weight gain in pregnancy	Neonatal birthweight most likely in normal range	Normal postnatal care
Low BMI (or weight loss) and malignancy	Likely normal neonatal birthweight	Support from primary care and multidisciplinary team managing cancer diagnosis. Support breastfeeding until cancer treatment makes untenable
Low BMI and eating disorders	Increased risk of LBW	Enhanced postnatal support such as early intervention health visiting[31] Assist with breastfeeding[32] Observe for deterioration of mental health, particularly obsessive-compulsive disorder/postnatal depression Risk of resurgence of eating disorders[33,34] Consider a MARF to social care/early intervention health visitor
Low BMI and malnutrition	Increased risk of LBW	MARF to social care/involve no recourse service, if applicable Early intervention health visiting Provide supplements and vitamins and fortified drinks Communicate concerns to primary care Postnatal depression related to social complexity

Abbreviations: BMI = body mass index; LBW = low birthweight; MARF = multi-agency referral.

in determining fetal outcomes and may help clinicians to detect women who would benefit most from serial growth scans. Pregnancy and comprehensive antenatal care act as a window to explore and address both medical and lifestyle factors related to a low BMI that might otherwise remain hidden and provide a means of referral to other services and specialties most appropriate to help and treat women with low BMI.

Disclosure of interests

There are no conflicts of interest.

Contribution to authorship

SC instigated and edited the article. RB researched and wrote the article; EG wrote and researched the article. All authors approved the final version.

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