Management of anorexia nervosa in pregnancy: a systematic and state-of-the-art review

Megan Galbally, Hubertus Himmerich, Shivanthi Senaratne, Phoebe Fitzgerald, Jeanette Frost, Nicole Woods, Jan E Dickinson

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School of Clinical Sciences, Monash University, Clayton, VIC, Australia (Prof M Galbally PhD); **Health Futures Institute, Murdoch University, Murdoch, WA, Australia** (Prof M Galbally); **School of Medicine, University of Notre Dame, Fremantle, WA, Australia** (Prof M Galbally); **Division of Obstetrics and Gynaecology, University of Western Australia, Crawley, WA, Australia** (Prof M Galbally, Prof J E Dickinson MD); **Department of Psychological Medicine, King's College London, London, UK** (H Himmerich MD); **King Edward Memorial Hospital, Subiaco, WA, Australia** (S Senaratne FRACP, P Fitzgerald PGradDipDiet, J Frost MBBS, Prof J E Dickinson); **Community Advisory Council, Women and Newborn Health Service, King Edward Memorial Hospital, Subiaco, WA, Australia** (N Woods LLB)

Correspondence to: Prof Megan Galbally, School of Clinical Sciences, Monash University, Clayton, VIC 3168, Australia
megan.galbally@monash.edu

Anorexia nervosa is a potentially severe, chronic, and relapsing mental disorder that is more common in women and girls during the reproductive years (usually defined as those aged 12–51 years). It is associated with suicide and mortality linked with the physical consequences of starvation. Although anorexia nervosa is a disorder of low prevalence, and even lower prevalence in pregnancy, it is associated with substantial risks for the mother and infant when under-recognised and undermanaged. Despite the complexity and risk of managing anorexia nervosa in pregnancy, few studies are available to guide care. We conducted a systematic review, identifying only eight studies that addressed the management of anorexia nervosa in pregnancy. These studies were case studies or case reports examining narrow aspects of management. Subsequently, we conducted a state-of-the-art review across research in relevant disciplines and areas of expertise for managing anorexia nervosa in pregnancy and synthesised the findings into recommendations and principles for multidisciplinary management of anorexia nervosa in pregnancy. These recommendations included a focus on the specialist mental health, obstetric, medical, and nutritional care required to ensure optimal outcomes for women and their infants. Despite the complexity and risks, a gap exists in the comprehensive guidelines and recommendations for managing anorexia nervosa in pregnancy. This Review provides multidisciplinary recommendations for clinical care in this area. Managing anorexia nervosa in pregnancy is an area of clinical care that requires a multidisciplinary approach and includes those experienced in managing high-risk pregnancies.

Introduction

Anorexia nervosa is a serious and potentially life-limiting psychiatric condition, which manifests as a disordered pattern of eating secondary to the relentless pursuit of thinness. This condition is characterised by chronicity and a relapsing or remitting pattern, with an increased prevalence in female individuals across the childbearing years (usually defined as age 12–51 years).[1,2] 0·3–1·0% of women have this eating disorder, which is characterised by restriction of calorie intake, low body weight, intense fear of weight gain, and disturbance in body image.[3] Anorexia nervosa is typically associated with restricting or binging and purging behaviours, or both, and often develops in people at high risk of anxiety and perfectionism.[4] Body-mass index (BMI) determines disease severity, with a BMI of 17–20 kg/m² considered mild, 16–17 kg/m² moderate, 15–16 kg/m² severe, and less than 15 kg/m² extreme.[3] However, these severity ratings, developed within DSM-5, have been found to have limited predictive ability of severity of illness in studies in Portugal, Italy, and the USA.[5–7] Although pregnancy was previously believed possible only for women with anorexia nervosa who were in remission, this belief is now recognised as not necessarily correct.[8] The UK Management of Really Sick Patients with Anorexia Nervosa (known as MARSIPAN) guidelines for very severe cases of anorexia nervosa highlight the considerable risks with managing moderate-to-severe anorexia nervosa, including as a fatal disorder.[9] However, this guidance and information is for non-pregnant adults and does not take into account the physical complexities that pregnancy will add to an already challenging medical situation. There are substantial physiological changes in pregnancy across all systems, including cardiac and endocrine changes, and there are additional requirements for care and monitoring of fetal growth and development, of which affect the challenges of assessing disease severity and managing weight loss and weight restoration in pregnancy.

Unlike mood disorders and anxiety and psychotic disorders, little guidance and research is available for anorexia nervosa in pregnancy. Perinatal mental health guidelines, including those in the UK and Australia, provide only limited or no mention of the assessment and management of eating disorders in pregnancy.[10,11] Assessment measures used outside of pregnancy, such

Key messages

- Anorexia nervosa in pregnancy is associated with increased risks of pregnancy complications and poorer outcomes for infants.
- Measures like body-mass index are less accurate in pregnancy for assessing severity or change in anorexia nervosa.
- Management of anorexia nervosa in pregnancy requires multidisciplinary care that considers the substantial physiological changes for women and requirements for monitoring fetal growth and development.
- Anorexia nervosa affects pregnancy and neonatal outcomes through low calorie intake, nutritional and vitamin deficiencies, stress, fasting, low body mass, and poor placentation and uteroplacental function.
- The threshold for nutrition rehabilitation in pregnancy needs to consider the differences in risks from poor nutrition, fasting, and low body mass for the pregnant woman and fetus.

as the Eating Disorder Inventory, or the reliance on body-mass index have been shown to have limited validity in pregnancy. The assessment and monitoring of measures and tools for anorexia nervosa require modification in the context of pregnancy.[12]

Substantial evidence has emerged from research into the developmental origins of health and disease, and this evidence has driven the current understanding of the importance of the perinatal period for the lifelong health of mothers and their offspring.[13] This research has highlighted the importance of maternal antenatal nutrition, pregnancy weight gain, and the infant's birth weight as critical risk factors and vital intervention points for improving lifelong health, particularly concerning non-communicable diseases.[14] Although research into external factors associated with poor maternal nutrition and weight gain in pregnancy, such as famine, have been well documented, there is a paucity of research into the understanding of starvation and low nutrition in pregnancy that are associated with mental health disorders such as anorexia nervosa.[15] However, there are clear implications from research of the lifelong suboptimal physical and health outcomes for offspring after maternal starvation in pregnancy.[15–17] Anorexia nervosa might affect obstetric and neonatal outcomes through low calorie intake, nutritional and vitamin deficiencies, stress, fasting, and low body mass, resulting in poor placentation and uteroplacental function.[18,19] Additionally, risks from untreated or undertreated anorexia nervosa in pregnancy include not only these medical and obstetric risks but also psychological and psychosocial risks as well as potential risks around an individual's insight and capacity for understanding the severity of their illness and need for treatment, including nutritional support.

Evidence has emerged on maternal and fetal outcomes after bariatric surgery, when pregnancy occurs before weight stabilisation. The rapid weight loss and mal-absorption during pregnancy, associated with recent surgery, might have profound effects on the maternal–fetal environment.[20,21] It is recommended that pregnancy is delayed for at least 12 months after bariatric surgery; however, there are now increasing presentations of pregnancy during this early post-recovery period.[20] The management of weight and nutrition for women with moderate-to-severe anorexia nervosa in pregnancy also has relevance for women with rapid weight loss and malabsorption from this iatrogenic surgical cause.

We present a clinical review of this area, including a systematic review of research reporting on management of anorexia nervosa in pregnancy and a state-of-the-art review of the broader areas of obstetric and mental health research relevant to the management of anorexia nervosa in pregnancy.

Anorexia nervosa and pregnancy

The prevalence estimates for anorexia nervosa in pregnancy are between 0·05% and 0·50%, and research suggests the risk of relapse in pregnancy is higher than in the post-partum period.[22,23] Despite this low prevalence, several large studies have reported an increase in obstetric complications and maternal risks in pregnancy for women with eating disorders. For women with anorexia nervosa, these reported obstetric complications include slower fetal growth, low birth weight and small for gestational age infants, low Apgar scores, and higher risk of neonatal resuscitation and perinatal death. For example, one 2020 study from Quebec, Canada, reported that women with anorexia nervosa in pregnancy had 1·32 times the adjusted risk of preterm birth (95% CI 1·13–1·55), 1·69 times the adjusted risk of a baby with low birth weight (1·44–1·99), and 1·99 times the adjusted risk of stillbirth (1·20–3·30) compared with women without anorexia nervosa in pregnancy.[1] Within this study, women with anorexia nervosa also had 1·90 times the adjusted risk of acute liver failure in pregnancy (95% CI 1·12–3·21) and 1·86 times the adjusted risk of admission to an intensive care unit in pregnancy (1·06–3·28) compared with women without anorexia nervosa.[1] Another study in Finland found that pregnant women with anorexia nervosa had babies with the lowest gestational age at delivery (mean age 39·6 weeks [SD 2·1]; adjusted p=0·032) and an increased risk of very premature birth compared with pregnant women with other eating disorders or no disorder.[24] This study also reported that babies of women with anorexia nervosa had an increased adjusted risk of stillbirth or neonatal death that was four times that of babies of women with other eating disorders or no disorder (adjusted odds ratio 4·06; 95% CI 1·15–14·35).[24] Suboptimal fetal growth has been shown to continue across the first year of life.[25] The potential for an intergenerational programming pathway has been suggested, with an assessment of data across three generations reporting an association of low birth weight with a higher risk of anorexia nervosa and vice versa.[1,8,26]

Anorexia nervosa in pregnancy is also associated with a high rate of maternal depression and anxiety, including perinatal depression, as well as other mental health co-morbidities.[14] For instance, a study in Japan of women with recovered eating disorders in the post-partum period, including those who have recovered from anorexia nervosa, reported 12 (50%) of 24 women developed postnatal depression.[23] Anorexia nervosa in pregnancy is associated with low rates of breastfeeding, with studies finding women were significantly less likely to be breastfeeding at 3 months postpartum than women without anorexia nervosa.[8,23,27] The cause of lower breastfeeding rates is unclear, but there are probably biological and psychological reasons, including body image disturbances and discomfort with body image, with the exposure of the breasts to feed and the intimacy of breastfeeding, as well as challenges in maintaining the nutritional requirements for the high calorific intake to sustain breastfeeding. Because

	Study type	Number of participants	Management of anorexia nervosa
Mazer-Poline and Fornari (2009)[28]	Case report	1	Psychiatric referral
Lanlan et al (2017)[29]	Case report	1	Nil
Cantrell (2009)[30]	Case reports	1	Nutritional counselling provided by the midwife
Milner and O'Leary (1998)[31]	Case report	1	Nil
Manzato et al (2009)[32]	Case report	1	Eating disorder unit admission
Lupatelli et al (2015)[33]	Cohort study	54	Psychotropic medication
Gohdil and Chen (1998)[34]	Case series	2	Percutaneous endoscopic gastrostomy
Zauderer (2012)[35]	Case report	1	Supportive treatment

Table: **Studies identified that reported on the management of anorexia nervosa in pregnancy**

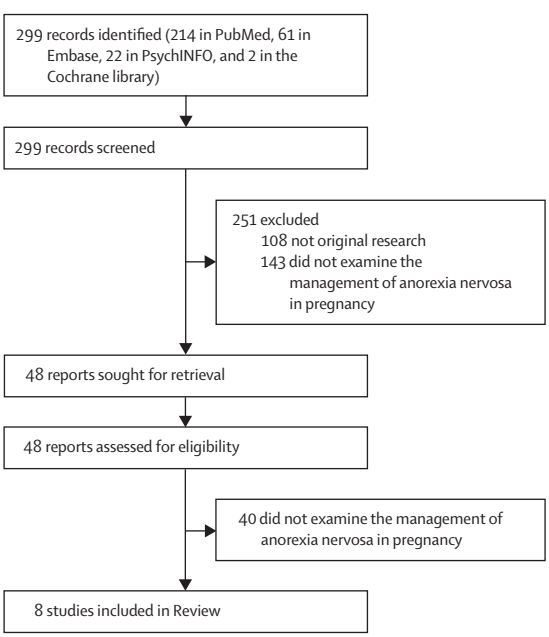

Figure: **Study selection**

breastfeeding can be an important aspect of early parenting care, with benefits for both mother and infant, improving rates of breastfeeding is a potential focus of care and intervention.

Managing anorexia nervosa in pregnancy is a challenging area of mental health, requiring a multidisciplinary team with expertise in managing high-risk pregnancies and a co-ordinated focus on physical and mental health across assessment, management, and recovery. Careful consideration of risks associated with physical health, mental health, and obstetric health are required across pregnancy and into the post-partum period.

Methods

Search strategy and selection criteria

As part of the systematic review, JF searched PubMed, Embase, PsychINFO, and the Cochrane library without language restrictions for research articles published from database inception to Oct 3, 2021. The search terms were ("pregnancy" or "prenatal" or "antenatal" or "perinatal" or "peripartum" or "childbirth" or "lactation") and ("anorexia nervosa") and ("management"). The search was limited to include articles on humans only.

The literature search was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-analysis guidelines. All studies addressing the management of anorexia nervosa during pregnancy were eligible. The inclusion criteria were examination of the management of anorexia nervosa during pregnancy, original research, empirical studies, and publication in a peer-reviewed journal. Studies were excluded if they were not original research or were animal studies or unpublished thesis and dissertation studies.

State-of-the-art review

After the systematic review, we did a state-of-the-art review of preconception, pregnancy, and postnatal management of anorexia nervosa in pregnancy across relevant research in perinatal mental health and eating disorders, obstetrics and maternal–fetal medicine, and dietetics and general medicine of pregnancy.

Results from the systematic review

The figure details a flowchart of the study selection. PubMed returned 214 results. Titles were reviewed to exclude papers that did not include original research and for relevance, after which 35 remained. Abstracts were then reviewed, leaving six relevant articles. Embase returned 61 results. After title review, seven remained; after abstract review, only two remained. PsychINFO returned 22 results. After review of the titles, four remained; however, none remained after abstract review. The Cochrane library yielded two results, neither of which were relevant. Of the remaining eight studies, six studies were single case reports, one study was a case series of two cases, and one study examined medication use during pregnancy in individuals with anorexia nervosa versus those without anorexia nervosa. The table shows the identified eight publications on the management of anorexia nervosa in pregnancy. These studies focused on describing individual management from case reports[28–32] or a specific aspect of management, such as medication[33] or gastrostomy,[34] or management focus for a specific discipline, such as nursing staff.[35] Concerningly, no publications were identified that reported on the overall management of anorexia nervosa in pregnancy across original research, reviews, or guidelines.

State-of-the-art review

Overview

Through our state-of-the art review, we identified several key areas related to the management of pregnancy in women with anorexia nervosa.

Preconception care

Preconception is the optimal time to offer interventions for perinatal mental health disorders, including anorexia nervosa. Women identified with anorexia nervosa should be offered treatment for it as soon as possible. According to most guidelines, such as the UK National Institute for Health and Care Excellence (NICE) guidelines, treatment for anorexia nervosa should involve psychological therapy along with additional support, including psychoeducation about the illness, monitoring of mental and physical health (eg, weight and risk factors), family or carer involvement, and a multidisciplinary team approach from health-care professionals.[36] Contemporary models of care also frequently include a role for peer support within services.

In addition to mental health treatment, all women in their childbearing years should have contraception and pregnancy planning conversations, ideally to optimise their physical and mental health status before conception. Although women with anorexia nervosa-associated amenorrhoea are less likely to conceive, pregnancy is still possible, particularly in the context of fluctuating weight. Notably, unplanned pregnancies and delays in the diagnosis of pregnancies are more common in women with anorexia nervosa, probably because of the misunderstanding that they are infertile.[37]

Preconception care and counselling provide an opportunity for health-care providers to perform a general health, mental health, and obstetric risk assessment, with the aim to optimise the pregnancy outcome for the woman and fetus. In addition to the ongoing medical assessments of women with anorexia nervosa, a preconception risk assessment should cover their medical, genetic, psychosocial, and mental health issues, including screening for alcohol and drug use. Preconception care is an important opportunity to discuss preventive health care, such as vaccinations, reproductive genetic carrier screening, folate supplementation for fetal malformation risk reduction, and cancer screening guidelines. Given the cardiac complications reported with anorexia nervosa, including a marked reduction in left ventricular mass and cardiac arrhythmia (eg, prolongation of the QT interval in individuals with hypokalaemia), a baseline echocardiogram, an electrocardiogram (ECG), and an electrolyte profile are recommended, and for some individuals cardiac MRI might be considered.[38] Consideration of a baseline bone density assessment is recommended, given the frequency of osteoporosis in women with anorexia nervosa and the challenges in managing this condition.[39] As with all preconception care, consideration should be given to changing any potentially teratogenic or otherwise contraindicated treatments for pregnancy, particularly, psychotropic drugs such as sodium valproate, as well as discussing with women the risks of smoking, alcohol, and illicit substances in pregnancy and options for support and interventions for reducing or ceasing use before pregnancy.[40]

Pregnancy care

Pregnancy is associated with substantial physiological changes, and the usual recommendations and guidance for adult patients with anorexia nervosa are often inapplicable or not relevant to monitoring and management. For instance, as pregnancy progresses the use of BMI to monitor weight gain becomes increasingly flawed as fluid volume increases and placental and fetal weight vary considerably. Although there is guidance from professional societies on expected pregnancy weight gain, weight gain varies considerably across individuals and it is difficult to account for weight from fluid, the uterus, placenta, and fetus. Furthermore, although weight stabilisation might be somewhat reassuring in a non-pregnant woman with anorexia nervosa, within the context of pregnancy this almost inevitably is associated with overall body mass weight loss.

Generally, in obstetric care, the recommended weight gain in pregnancy is determined by pre-pregnancy BMI. For those with a BMI of less than 18·5 kg/m², 12·5–18 kg is the recommended weight gain in pregnancy, with 0·5 kg per week across the second and third trimester and a 0·5–2 kg gain across the first trimester.[41] For those with a pre-pregnancy BMI of between 18·5 kg/m² and 24·9 kg/m², the recommended overall weight gain in pregnancy is 11·5–16 kg.[41] However, no specific pregnancy guidance is available for individuals with an extremely low weight (BMI ≤15 kg/m²) before or during pregnancy, and these people require individualised management.

Additionally, many of the blood markers used to monitor the severity of weight loss are altered by the physiological changes of pregnancy and, therefore, interpretation in the context of anorexia nervosa and pregnancy needs adjustment. Aspects of chronic anorexia nervosa also require specific consideration, such as understanding anorexia nervosa and a woman's capacity to be in labour in the context of potential cardiac muscle wasting with left ventricular atrophy from chronic starvation.[42] A consensus recommendation based on the risks for pregnant women with anorexia nervosa is that repeat echocardiograms and ECGs should be performed in the third trimester. Cardiac-mass index is a measure of muscle mass and can reflect cardiac atrophy. Unfortunately, the use of this index might not be accurate in pregnancy given the pregnancy-related haemodynamic changes that take place. However, it is best practice to evaluate a woman with anorexia nervosa with an echocardiogram to ensure reasonable cardiac function. A thorough physical assessment at each antenatal visit should include assessment of blood pressure and pulse rate (both lying and standing), body temperature, and muscle strength, and an examination for signs of rash (noting common pregnancy-related skin changes in

Panel 1: **Minimum recommended factors that should be monitiored in women with anorexia nervosa in pregnancy**

In individuals with anorexia nervosa who are pregnant, many factors require monitoring: sodium concentration, potassium concentration, magnesium concentration, phosphate concentration, chloride concentration, iron studies, vitamin D and bone mineral density, blood sugar concentration (fasting or random) and HbA_{1c}, liver function (including bilirubin, aspartate transaminase, alanine aminotransferase, and gamma-glutamyl transferase), bone marrow function (including full blood examination, white cell count, neutrophil count, platelets, and haemoglobin), inflammatory markers (eg, C-reactive protein and erythrocyte sedimentation rate), cardiac function (electrocardiogram and echocardiogram, blood pressure [lying and standing], and heart rate [lying and standing]), and body temperature.

contrast to those commonly seen with anorexia nervosa), infection, and nutritional deficiency, as well as a cardiac system examination and a complete obstetric examination appropriate for the gestational period. Panel 1 lists the recommended common factors that should be monitored in women with anorexia nervosa in pregnancy.

Additionally, laxative misuse, which might be ongoing in pregnancy, is dangerous and is also ineffective in inducing weight loss.[43] Ongoing stimulant-type laxative misuse can result in several gastrointestinal problems, loss of smooth muscle in the gut, and electrolyte abnormalities, including hypokalaemia and hyponatremia from persistent diarrhoea and dehydration.[43] Dependence on stimulant-type laxatives to defecate might occur with long-term misuse.[43] Pregnancy is also associated with an increased risk of developing constipation, particularly in later pregnancy due to prolonged gastrointestinal transit time and increasing progesterone concentrations.[44] In both anorexia nervosa and in pregnancy, osmotic laxatives are considered safer and should be encouraged in place of stimulant-type laxatives to treat constipation.[43,44]

The published evidence for obstetric complications and fetal growth in pregnancies of women with anorexia nervosa shows some consistent medical observations, predominantly maternal anaemia, stillbirth, preterm birth, and fetal perturbations of growth, including symmetrical growth restriction and low birth weight.[45–47] These complications of pregnancy are probably associated with pre-pregnancy malnutrition and its sequelae and require careful fetal assessment and monitoring during pregnancy.

Given its central role in glucose metabolism regulation, immunomodulation, and reproductive function, the role of leptin in fetal growth disorders is an area of interest.[48] Leptin is important in placentation and fetal growth regulation, and the very low leptin concentrations in women with anorexia nervosa might affect early trophoblast development and function, potentially negatively influencing later placental-mediated pregnancy outcomes.[49]

The eating behaviours of women with anorexia nervosa in pregnancy can range in severity; therefore, the effects of the disease on maternal–fetal wellbeing are varied. Generally, increased fetal surveillance is performed to recognise growth abnormalities and monitor fetal wellbeing, commencing in the first trimester with pre-eclampsia screening, with ultrasound assessments every 4 weeks from the second trimester.

Criteria for admission for nutritional rehabilitation typically includes weight loss; however, in pregnancy, admission might also be in the context of lack of weight gain or low weight for pregnancy. A maternal BMI in pregnancy of less than 18 kg/m² with a pre-pregnancy BMI of 18 kg/m² or less should be a flag for consideration of nutritional support. Nutritional support should also be considered if there is suboptimal fetal growth (typically with symmetrical fetal growth restriction less than the tenth percentile for gestation or the crossing of individual growth centiles by 30–40 points) or clinically significant changes in blood parameters (eg, in maternal electrolytes, haemoglobin or liver function tests) or in physiological markers (eg, postural hypotension, tachycardia, low blood pressure, or heart rate), or changes on ECG. In a state of malnutrition, the heart rate can be inappropriately low for pregnancy, which would appear in the ECG as sinus bradycardia. Varied conduction issues could be present, including long QTC, which is indicative of impaired cardiac function. Hypoglycaemia is a notable reflection of liver dysfunction and lack of protective glycogen stores in malnutrition, and warrants admission for nutritional restoration, particularly in pregnancy.

An individual with an eating disorder who is severely malnourished is unlikely to be able to reverse starvation syndrome on their own. Timely treatment for anorexia nervosa, including nutritional rehabilitation with appropriate macronutrient and micronutrient intake and subsequent weight gain, is crucial in reducing anorexia nervosa-associated morbidity and mortality.[50] For individuals at high risk of medical complications, such as women in pregnancy, an inpatient admission or an intensive outpatient or day-care treatment should be considered. An inpatient admission can facilitate medical stabilisation through safe nutrition and weight restoration, as well as the prevention and treatment of refeeding syndrome, to reverse the acute cognitive effects of severe malnutrition. Inpatient nutritional rehabilitation of anorexia nervosa in pregnancy is very similar to treatment in the non-pregnant state. A multidisciplinary approach to inpatient management is essential. When deciding on outpatient care, day care, or inpatient care, various factors should be taken into account: the BMI, the rate of weight loss (eg, 1 kg per week or more) or, in pregnancy, a lack of weight gain or concerns with fetal growth, and the need to actively

Panel 2: **Recommendations for the clinical management of each aspect of care in inpatient nutritional rehabilitation of women with anorexia nervosa in pregnancy[52–54]**

Refeeding precautions:
- Patients can still be at risk of refeeding syndrome for 7–10 days after nutrition rehabilitation and, therefore, require close monitoring after refeeding, including in pregnancy.
- Prophylactic daily supplementation of 300 mg thiamine, a pregnancy multivitamin, vitamin B complex, and 500 mg phosphate twice a day should be commenced.
- At the initial presentation and throughout refeeding, the medical team should monitor the concentrations of phosphate, magnesium, urea, electrolytes, iron, vitamin B12, vitamin A, vitamin D, and folate. Liver function tests and full blood examinations should be done daily.
- Low concentrations of electrolytes and nutrient deficiencies should be supplemented as necessary.

Nutritional route:
- Close collaboration and coordination of care within the multidisciplinary team is recommended, including between the obstetric physician and psychiatrist, to determine the best mode of feeding for the patient (oral *vs* enteral).
- Enteral feeding is recommended if the patient is unable to meet nutrition requirements orally or, if on initial presentation, there is cardiac instability or deranged electrolytes.

Nutrition requirements:
- The estimated energy requirement for nutrition restoration calculation is 120 KJ/kg × 1·4 activity factor × 1·5 repletion factor + 1400 KJ for second trimester or 1900 KJ for third trimester of pregnancy.
- Protein requirements are based on the pregnancy recommended daily intake for protein of 1 g/kg per day, which is easily exceeded in the refeeding process.
- Fluid requirements consist of 35–45 mL/kg per day or adequate intake >2·3 L per day.

Initiation of nutrition:
- The patient should be started at 6300 KJ per day regardless of nutritional route and pregnancy gestation.
- Enteral feeding should consist of continuous enteral feeding over 24 h using a nutritionally complete feed with low-to-no fibre and low-to-moderate carbohydrate content.
- The oral diet should be made up of three meals and three snacks per day; if the patient is unable to finish their main meal or snack, a nutrition supplement (6·3 KJ/mL) top-up (200 mL for meals and 100 mL for snacks) should be provided.

Feeding advancement:
- Energy intake should increase by 2000 KJ every 2–3 days until the target energy requirement met.
- For patients on enteral feeds, a slow transition to an oral diet should be considered (ie, continuous feeds and oral diet, then overnight feeds and oral diet, then full oral diet and nutrition supplements only).
- The increase of energy intake should be delayed in patients with critically low potassium, phosphate, or magnesium concentrations until these concentrations are corrected.
- The upper level of intake of vitamin A (2800–3000 µg per day) should not be exceeded in pregnancy with oral diet and feeds.

Monitoring:
- Panel 1 lists the minimum pregnancy monitoring for anorexia nervosa.
- 1:1 nursing supervision should be considered to provide meal support and reduce opportunities for eating disorder compensatory behaviours; at a minimum, mealtime supervision should be implemented.
- Bed rest is recommended during the initial stages of the refeeding process.
- Food intake and fluid balance charts should be implemented to monitor all food and fluid intake, enteral feeds, and urine output.
- Bowel movements should be monitored; if constipation is suspected, suitable aperients should be considered.
- Blinded daily weighing should be done, in a hospital gown, before breakfast and after first void. Signs of refeeding oedema should be monitored because this can artificially increase weight.
- Regular multidisciplinary team meetings should be scheduled to discuss progress with the patient and plan next steps of care.

monitor medical risk parameters, the person's current overall physical health, specific mental and physical comorbidities (eg, gestational diabetes or type 1 diabetes), and whether family, carers, or a partner can support a patient and keep them from serious harm as a day patient.[51] Oedema is not uncommon as the pregnancy progresses, but refeeding and heart failure can also be associated with oedema in anorexia nervosa and as such the differential diagnosis of any oedema should be carefully considered.

Panel 2 outlines inpatient nutritional rehabilitation recommendations for women with anorexia nervosa in pregnancy. Wherever possible, the aim of clinical management of anorexia nervosa should be collaborative care with women and their families, including when nutrition restoration is required. However, there are instances when it might be necessary to consider involuntary treatment for the safety of a woman in pregnancy (eg, when impairment of capacity results from severe starvation and low body weight), depending

on the Mental Health Act and laws within a specific jurisdiction.[55] If the nutritional needs cannot be met, nasogastric tube feeding could be considered, which remains a clinically important option in pregnancy when increased intake might also be limited by common pregnancy complications, such as reflux, heartburn, and slower digestion associated with the hormonal changes involved in pregnancy.[56,57] For some women in later pregnancy, their preference might be for nasogastric feeding over increased oral intake to improve fetal growth, reduce the likelihood of low birth weight and preterm birth, reduce the likelihood of infection, support labour, delivery, and recovery from birth, and minimise the discomfort of heartburn that increased oral intake can cause. An important principle is that the provision of clinical care should always align with the aim of least restrictive practice, be trauma-informed, and wherever possible be collaborative with the women and their families.

Outside of pregnancy, anorexia nervosa is commonly associated with deficiencies, including iron, folate, zinc, and vitamin A.[58] Anorexia nervosa in pregnancy adds the need to consider supplementation for iodine, vitamin B12, vitamin D, and electrolytes if these are deficient, to improve blood concentrations.[52] At a minimum, all women in pregnancy are advised to take a prenatal multivitamin containing iodine and folate daily. Women with anorexia nervosa might also require routine thiamine supplementation. Additionally, women with anorexia nervosa are at a significantly higher risk of osteoporosis and, therefore, might begin pregnancy with compromised bone calcium reserves.[48] If dietary calcium intake is suboptimal, increased intake of calcium-rich foods in the diet (eg, cheese, milk, and yoghurt) should be encouraged. If supplementation of calcium is required, combining this with vitamin D should be considered to enhance absorption. Pregnancy and lactation can be associated with further effects on bone density, and, as such, adequate calcium is of increased importance to prevent the worsening of any pre-existing bone density problems in women with anorexia nervosa. Although vitamin A requirements increase slightly in pregnancy due to tissue and organ development, it is important to avoid excess consumption.[52] If deficiency is suspected, supplementation with beta-carotene has been preferred over retinol during pregnancy.[21]

In women with anorexia nervosa, hypokalaemia is frequent and often the result of vomiting. Thus, it is not enough to prescribe oral potassium supplementation; these women will also need support to stop or reduce vomiting. Hypokalaemia might also be a result of insufficient magnesium. Therefore, magnesium supplementation is indicated in persistent hypokalaemia. If a patient shows low phosphate concentrations, this finding might indicate refeeding syndrome, suggesting the need to check concentrations of other electrolytes as well as clinical signs of refeeding syndrome.[59] After recent bariatric surgery, or when rapid weight loss occurs in anorexia nervosa, wider supplementation should be considered, for example, folic acid, iodide, iron, calcium, thiamine, zinc, selenium, copper, magnesium, biotin, riboflavin B2, niacin B3, pyridoxine B6, vitamin C, vitamin D, vitamin A, vitamin E, vitamin K, and vitamin B12. Further recommendations during pregnancy and lactation are detailed elsewhere.[21] In people with chronic anorexia nervosa, compensatory mechanisms might result in higher levels rather than always a deficit; therefore, individual monitoring and supplementation are recommended.

To our knowledge, no trials specifically in pregnancy report on evidence-informed and NICE-recommended psychological interventions for anorexia nervosa. Equally, there is no evidence to suggest that psychological interventions are less effective in pregnancy than outside of pregnancy. These interventions include eating disorder-focused cognitive behavioural therapy, Maudsley anorexia nervosa treatment for adults (MANTRA), specialist supportive clinical management, and eating disorder-focused focal psychodynamic therapy.[60]

Substantial therapeutic elements at the beginning of any psychotherapy for people with anorexia nervosa are the development of a therapeutic relationship, the development of motivation for therapy, psychoeducation, the identification of the processes that are maintaining the patient's illness by drafting a formulation together with the patient, and the introduction of regular eating and weighing, which includes plotting a weight chart with the patient to recognise trends.[60]

In anorexia nervosa, the overevaluation of shape and weight and the resulting fear of weight gain will occupy a prominent place in the formulation, as weight gain is often referred to as the core psychopathology that leads to dieting, vomiting, excessive exercise, and the use of laxatives.

During eating disorder-focused cognitive behavioural therapy, helpful therapeutic tools to counter these cognitions and behaviours might include writing a pros and cons list concerning the anorexia nervosa from a 5-year perspective (which helps patients to bring their long-term goals into their minds), practising breaking dietary rules, introducing avoided foods, preparing for and handling events that are known to lead to mood changes and pathological behaviours and doing problem-solving and cognitive work on distortions and irrational core beliefs around weight and shape.[61] Pregnancy, childbirth, and puerperium could provide psychotherapeutic opportunities to reconsider a patient's long-term goals, recruit a support network, stop risky behaviours (eg, laxative misuse), and embrace new challenges and changes (eg, early parenting and breastfeeding). Awareness of any challenges for a woman with anorexia nervosa of feeding a baby, whether breastfeeding or formula feeding, are important to consider within a psychotherapeutic context within the perinatal period.

MANTRA is based on Schmidt and Treasure's cognitive-interpersonal maintenance model.[62] This model aims to target the maintaining factors of anorexia nervosa, such as unhelpful thinking styles (eg, rigidity, perfectionism, and obsessive–compulsive traits), faulty cognition and beliefs (eg, the benefits of anorexia nervosa), emotion avoidance, and responses from others that do not support recovery (eg, criticism or enabling of behaviours).[63]

However, in providing psychological assessment and intervention for women in the perinatal period, the emerging parent–fetus and parent–infant relationship and the impact of maternal mental health on infant wellbeing should be considered, as these factors are an important part of any perinatal mental health care.[64] Although anorexia nervosa will not affect every woman's emerging relationship with their infant or the socio-emotional wellbeing of the infant, it is important as part of assessment and management planning to consider this relationship and when indicated include evidence-informed psychological interventions that support the parent–infant relationship.[65,66] Research that examined attachment using the Adult Attachment Interview has found lower reflective functioning and high rates of dismissive attachment style in women with severe anorexia nervosa compared with women without anorexia nervosa.[67] Maternal attachment style is not inevitably associated with parent–infant attachment classification with some transmission gap, such that the attachment style in a parent does not always predict with certainty the attachment style of the infant as other unaccounted for factors influence the intergenerational parent–infant attachment relationship.[68,69] To our knowledge, intergenerational attachment studies of mothers with anorexia nervosa and their infants have not been done. When doing an assessment and management plan, it is also important to consider the partner, family, cultural, and community context in the management of anorexia nervosa in pregnancy.

Evidence for pharmacological interventions in anorexia nervosa outside of pregnancy is limited, but it is important to manage the physical health consequences of anorexia nervosa adequately as well as common mental health comorbidities.[59,70] However, when using pharmacological treatments in pregnancy, the known maternal and fetal risks should be considered, as well as the amount of exposure typically measured through placental passage, to make the safest choice. A key aim when using pharmacological treatments is to consider principles such as the lowest effective dose and avoiding the use of multiple drugs.[71] Unfortunately, for most of the drugs used to treat comorbid mental disorders, there is only limited evidence for safety in pregnancy, often with a range of inconsistent findings across pregnancy, infant, and child outcomes.[72] Therefore, it is imperative that the clinician supports the woman's informed decision making while also highlighting that the risks of pharmacological treatment are best compared with risks of untreated illness, which, particularly in the context of anorexia nervosa, are likely to adversely influence pregnancy and infant outcomes.[73] For a more comprehensive review of the risks and benefits of specific psychopharmacological treatments in pregnancy on pregnancy and child outcomes, there are books, journal articles, and national guidelines.[10,74,75]

Post-partum care

The post-partum period and transition to parenthood can be a challenging time for women with anorexia nervosa, with evidence to suggest disordered eating is likely to persist into the post-partum phase.[76] Feeding an infant or toddler, as well as the physical and emotional changes across this period, are more challenging for women with anorexia nervosa. Even when there has been successful weight restoration and management in pregnancy, the risk of return to rigid restrictive practices is high once the motivation of fetal wellbeing is removed.[76,77] Furthermore, the risk for depression and attachment difficulties is increased in these women.[8,78] Therefore, a comprehensive plan that considers the ongoing support and management of anorexia nervosa, but that also screens and monitors for emergence of depression, anxiety, and difficulties with parenting (eg, infant feeding and behaviour) and supports the healthy development of the mother–infant relationship, is crucial in managing anorexia nervosa across the post-partum period. Although there are currently no specific mother–infant relationship interventions trialled for women with anorexia nervosa, several evidence-informed attachment-based interventions and parenting support programmes can be used, including a video feedback intervention that has been trialled successfully in supporting women with bulimia.[65,79]

In the post-partum phase, it is recommended that the patient commits to a meal plan and energy intake suited for post-partum recovery, and where applicable also breastfeeding. Generally, a woman is referred to her general practitioner for weekly blood tests for the first 4–6 weeks and then the frequency is reduced as improvement occurs. The general practitioner can also measure blood pressure, pulse, and temperature to ascertain early any decline in nutritional status. If an admission for inpatient mental health care is required and it is safe and appropriate for the baby to remain with their mother, then an admission to a mother and baby unit is recommended.[80] Although access to inpatient mother and baby unit services is far from universal, where available it is preferable to avoid prolonged separations during inpatient treatment and to provide crucial support for the mother–infant relationship, parenting, and the family as a whole.

Breastfeeding is recognised as an effective method to benefit the health and wellbeing of an infant and is strongly promoted as a health intervention after delivery of a child—for the child and the mother. However,

women with anorexia nervosa have been reported to display more negative attitudes towards breastfeeding and exhibit more breastfeeding-associated adverse effects.[81] Lactation has higher nutrient demands than pregnancy. Lactating mothers need an additional 2000–2100 kJ per day to meet their energy needs. Women with anorexia nervosa should be encouraged to eat a wide variety of foods from core food groups, including regular high-protein, high-energy snacks or nutritional supplements between main meals. It is important that these women engage with a dietitian for ongoing nutritional support postnatally. Furthermore, there is an increased requirement for iodine during breastfeeding, and it is recommended all breastfeeding women take an iodine supplement containing 150 µg daily.[82]

Limitations

Although a systematic review was conducted as part of this Review, given the limited findings identified, the Review relies predominantly on a state-of-the-art review of the broader literature that is relevant to managing anorexia nervosa in pregnancy. Thus, the validity of the conclusions and recommendations in this Review are limited.

This Review refers to pregnant women; however, we acknowledge there might be pregnant individuals with anorexia nervosa who do not identify as women, and the information within this Review can be adapted to provide individualised sensitive care as appropriate.

The guidance that we have provided targets specifically the management of pregnant women with anorexia nervosa, given that the psychological and medical risk is particularly high in this population. Some of the approaches and therapeutic elements described in this Review could also be relevant for other types of eating disorders, such as atypical anorexia nervosa, avoidant restrictive eating disorder, bulimia nervosa, or binge eating disorder. However, although anorexia nervosa shares restrictive eating characteristics with avoidant restrictive eating disorder, and shares overevaluation of weight and shape with atypical anorexia nervosa and bulimia nervosa, there are clinically relevant differences between the disorders.[3] For example, people with avoidant restrictive eating disorder do not share the weight and shape concerns that patients with anorexia nervosa have, and people with binge eating disorder often develop obesity and metabolic disorders, such as type 2 diabetes and dyslipidaemia.[57] Thus, patients with binge eating disorder have a metabolic profile that is diametrically opposite to that of patients with anorexia nervosa. Therefore, the guidance presented in this Review is not valid for the management of pregnant women with all forms of eating disorders.

Conclusions

The management of anorexia nervosa requires a multidisciplinary team approach with expertise across mental health, specialist medical care, and dietetics at a minimum; in pregnancy, key experts include obstetricians (particularly experts who manage high-risk pregnancies), physicians with pregnancy expertise, dieticians who also have expertise in pregnancy nutrition requirements, paediatricians, and mental health clinicians with perinatal expertise. Although many of the principles developed for the management of anorexia nervosa in adults are applicable in pregnancy, they require expert modification and adaptation to the substantial physiological, psychological, and social changes in pregnancy, and fetal growth and wellbeing should also be taken into consideration. Nutritional rehabilitation might be part of the treatment of women with anorexia nervosa in pregnancy, but this treatment should be done in collaboration with the woman and her family if possible.

Contributors

MG was involved in the conceptualisation and coordination of the Review and contributed to writing the original draft and to reviewing and editing the paper. SS contributed to writing and editing the paper. JED contributed to writing the original draft and to reviewing and editing the paper. JF did the systematic literature review and contributed to writing and editing the paper. PF contributed to writing the original draft and to reviewing and editing the paper. NW contributed to writing and editing the paper. HH contributed to writing and editing the paper. All authors have responsibility for the final submitted version.

Declaration of interests

We declare no competing interests.

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