# Effects Of Overweight and Obesity During Pregnancy: A Narrative View of Physiological Outcomes, Prenatal Risks, Care Challenges, And Early Intervention Approaches

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***Abstract*—Background: There has been significant research on overweight and obesity (OWO) in pregnancy, but the majority of studies have investigated individual complications, providing a partial overview of the way in which pregnancy can be managed. Objectives: To provide a comprehensive review of the literature regarding OWO clinical considerations and management strategies prior to conception, during pregnancy and after delivery. Methods: In September 2025, a narrative literature review of PubMed was performed. Eligible studies were full text English language studies that contained human participants and for which there were no restrictions on publication dates. Findings: Overweight and obesity affect pregnancy in four key areas: physiological changes, complications to the mother and fetus, difficulties with prenatal care and interventions. Laboratory findings and clinical management may be impacted by altered metabolic and inflammatory responses in women with OWO. Gestational diabetes, preeclampsia, fetal overgrowth, congenital abnormalities, still birth and preterm birth are all risks associated with obesity. This can also lead to less accurate prenatal ultrasound estimates. To reduce complications and optimise the mother and baby outcomes, early counselling, suitable weight management and individual antenatal intervention is essential.**

**Conclusions: An extensive preconception and antenatal care program is needed to enhance pregnancy outcomes for women with OWO. Comprehensive clinical and preventive measures, including early counseling, can minimize complications of pregnancy and facilitate long-term child and mother's health.**

***Index Terms*—Overweight, Obesity, Pregnancy, Prenatal Care, Maternal Complications, Ultrasound, Preconception Counseling.**

## I. INTRODUCTION

Obesity is now becoming a major concern in the world and has risen significantly, making it a matter of concern for the World Health Organization (WHO). Worldwide, there are approximately 2.5 billion adults who are overweight, including 890 million who have obesity. Some 44% of all women of reproductive age are affected. Of particular concern is maternal overweight or obesity (OWO) which at 50% or more in the USA and between 7% and 25% in European countries is prevalent in pregnancy.

According to the measurement of body mass index (BMI), overweight is 25–29.9 kg/m2, obesity is BMI ≥30kg/m2 and severe obesity is BMI ≥40kg/m2. Obesity is a chronic disease and an abnormal metabolic condition that comes with more than just excess body fat, but also metabolic disturbances, insulin resistance, abnormal lipid metabolism, inflammation and oxidative stress. These physiological changes may have a negative effect on both the development of the placenta and fetal growth.

Pregnant women with OWO have higher risks of complications in delivery, preeclampsia, hypertension, and GDM. Their newborn babies are also at high risk of poor fetal development, birth defects, stillbirth and preterm delivery. Moreover, the mother's obesity in the fetal period may help the higher incidence of metabolic disorders and obesity later in life and thus the old intergenerational cycle of ill-health.

Ideally the prevention and management should start before getting pregnant, with lifestyle changes and weight management, as well as selected medical interventions and also weight gain during the pregnancy period. When properly indicated, bariatric surgery can also offer long-term health benefits to the woman with serious obesity.

A number of research studies have been performed on pregnancy complications caused by obesity; however, most of the evidence has focused on individual clinical problems and not on overall maternal care. Hence, this narrative review seeks to consolidate the physiological mechanisms, maternal and fetal risks, prenatal management and prevention strategies related to OWO to give a holistic insight for clinical management and better pregnancy outcomes.

## II. METHODS

### *A. Search Strategy and Selection Criteria*

A narrative literature review was performed in order to review how overweight and obesity (OWO) can impact various clinical components of pregnancy and prenatal care. We conducted a thorough electronic search in PubMed database, as of January 2025. Relevant Medical Subject Headings (MeSH) were used as well as appropriate Boolean operators: pregnancy, gestation, overweight, obesity, gestational weight gain, insulin resistance, hyperinsulinemia, placental changes, prenatal imaging, fetal growth, macrosomia, gestational diabetes mellitus, and bariatric surgery. Only full-text papers in the English language on human subjects were reviewed, but no restrictions were imposed on the year of publication. High quality evidence (such as systematic review/meta-analysis, randomized controlled trials, longitudinal observational studies, and cohort studies) was favored. Grey literature was excluded to ensure that mostly peer-reviewed scientific evidence relevant to current clinical practice was collated in the review.

### *B. Screening, Data Extraction Process, and Quality Assessment*

The review methodology used was systematic identification of relevant publications, screening, selection, data extraction and thematic organization. Both the reviewers independently conducted literature search and initially screened article titles and abstracts on their feasibility to be included in the review objectives. The obtained records were then organized using EndNote software for management of references. Full-text articles were then analyzed based on the inclusion/exclusion criteria.

Standardized Microsoft Excel spreadsheet was used for the data extraction for uniformity and consistency. Data obtained comprised authorization, year of publication, body mass index classifications, physiological changes, risks to mother and child, challenges during prenatal care and prevention/therapy to combat these changes. Extracted information information was cross checked - independently by reviewers, to reduce errors and insure completeness.

Data was aggregated into meaningful themes according to clinical relevance to midwife care and pregnancy care. Literature collection was carried out till thematic saturation was obtained (no new information was gained from other studies). In line with Baethge et al. suggestions, the methodological quality of the narrative review was assessed by using the Scale for Assessment of Narrative Review Articles (SANRA). Any divergences of opinion or evaluation were discussed and settled by consensus.

Most publications included in the book did not explicitly differentiate between genders, and biological sex, so it was used to reflect each study's terminology. In recognition of this, throughout the review the word women and related terms were related consistently.

## III. PHYSIOLOGICAL CONSEQUENCES OF OVERWEIGHT AND OBESITY DURING PREGNANCY

During pregnancy, there are several physiological and metabolic adaptations in order to meet maternal energy requirements and to allow for the development of the fetus. These adaptations, however, could vary significantly among women who are overweight and obese (OWO). Women with OWO often have greater

adiposity, low insulin sensitivity, abnormal lipid metabolism, altered fatty acid and amino acid profile, chronic inflammation and oxidative stress when compared to normal weight women. Such possible disturbances may impair the functioning of the placenta or play a role in unfavorable pregnancy outcomes.

A. Fat Accumulation

Fat deposition and gain in pregnancy is a normal physiological adaptation and adipose tissue is a significant endocrine and metabolic organ. Belly fat is divided basically into 2 parts: visceral adipose tissue (VAT) or the fat that surrounds the internal organs and subcutaneous adipose tissue (SCAT) or the fat lying below the skin. VAT has a particularly large significance in the regulation of metabolic processes, lipid metabolism and inflammatory activity.

Fat distribution throughout the gestation changes and depends upon maternal BMI as per studies. Both in women with normal BMI, preperitoneal fat thickness tends to rise with pregnancy and subcutaneous fat thickness tends to decrease. On the other hand, the fat deposits are higher in both compartments in women with OWO and the amounts of both could be reduced during pregnancy.

Differences between visceral fat distribution have been observed with MRI amongst BMI groups. These results indicate that evaluation of the body fat distribution of visceral fat and subcutaneous fat can be used to assess maternal metabolic risk beyond BMI. However, more studies are needed to determine their clinical value.

B. Insulin Resistance and Hyperinsulinemia

During pregnancy, insulin resistance is stimulated as a natural phenomenon by placental hormones so that the mother has plenty of glucose to pass on to her baby. During pregnancy there is also a reduction in insulin sensitivity, ranging around 40-80% and being more evident in women with OWO.

HOMA-IR and HOMA2-IR are among the insulin resistance indices associated with maternal obesity, which are increased, while insulin secretion is also increased as pancreatic beta cells try to compensate for decreasing insulin sensitivity.

But in women with obesity, this response may be insufficient, leading to impaired glucose regulation and decreased functional capacity of beta cells. Changes in fasting blood glucose, C-peptide, HbA1c have also been described.

These metabolic disturbances can affect various aspects of placental development, vascular function, inflammation, nutrient transport and mitochondrial activity and therefore have the potential to heighten the risk of pregnancy complications.

C. Dyslipidemia

Just as in all mammals, in people the growing energy needs of the fetus cause a natural rise in maternal lipid concentrations, especially in the last third of pregnancy. The changes in total cholesterol, triglycerides, high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C) constitute a physiological response.

Compared to women with a normal BMI, there is likely an increased degree of lipid abnormality among women with OWO. There have been reports of increased levels of total cholesterol and LDL cholesterol although the extent of increase during pregnancy may be a little lower compared to others. Other results are weight loss, suppression of HDL-C, disruption of cholesterol transport activity and the decreased activity of lecithin-cholesteryl acyltransferase.

Evidence related to triglyceride levels is mixed, and increased levels of apolipoprotein B (ApoB) and an increased ratio of ApoB to apolipoprotein A (ApoB/ApoA) have been linked to higher pre-pregnancy BMI levels. While there have been suggested lipid reference values in pregnancy, there is no standard table to differentiate the normal physiological changes from dyslipidaemia at high body mass index during pregnancy.

D. Alterations in Fatty Acids, Acylcarnitines, and Amino Acids

The excess fat and the insulin resistance drive increased fat breakdown from fat stores, causing a rise in free fatty acids (FFAs) in the blood. An increase in concentration of fatty acids has been linked to increase in pre-pregnancy BMI level, all throughout of gestation period.

High levels of FFA can lead to abnormal deposition of lipids within the placenta and maternal tissues, which can have a negative effect on cell function. Increased saturated and monounsaturated fatty acids identified in

obese pregnant women. Various modifications of polyunsaturated fatty acids have also been documented, such as increased amounts of pro-inflammatory omega 6 fatty acids and decreased levels of specific omega 3 fatty acids.

These imbalances can lead to chronic inflammation in the body. Changes in acylcarnitines that are involved in mitochondrial fatty acid metabolism have also been described. Women with obesity showed high levels of acetylcarnitine, 3-hydroxy butyrylcarnitine and oleoylcarnitine, particularly in the late stages of pregnancy. However, evidence available on amino acid changes is limited, and some studies show an increase in arginine during the 2nd trimester but limited consistent differences in other amino acids have been found.

E. Chronic Inflammation and Oxidative Stress

Persistent low-grade inflammation that is associated with overweight and obesity can disrupt the normal inflammatory balance needed for normal placental growth and function. Inflammatory markers, such as C-reactive protein (CRP), adenosine deaminase (ADA) and Interleukin-6 (IL-6) are often increased in OWO pregnant women.

The relationship between maternal BMI and CRP concentrations has been demonstrated by several studies, and this relationship was not the same across different populations. The association of maternal markers of inflammation with offspring adiposity also needs to be further explored.

Obesity-related inflammatory processes can lead to the production of reactive oxygen species (ROS) which will cause a redox imbalance and could also influence placental function and pregnancy outcome. Important naturally occurring compounds which are certain antioxidants and anti-inflammatory effects have been studied for their protective involvement; however, the clinical efficacy and safety to use during pregnancy have yet to be evaluated. All in all, the metabolic and inflammatory derangements of maternal OWO can add risks to complications for the mother and fetus.

Hence, all women with obesity should have early risk assessment, tailored monitoring and antenatal management to achieve more favourable pregnancy outcomes.

## IV. RISKS OF OVERWEIGHT AND OBESITY IN MATERNAL CARE

A. Gestational Diabetes Mellitus (GDM)

Maternal overweight and obesity (OWO) are strongly associated with gestational diabetes mellitus (GDM), with approximately 65–75% of affected pregnant women classified as overweight or obese. Studies indicate that higher pre-pregnancy body mass index (BMI) is associated with earlier GDM diagnosis and increased fasting plasma glucose concentrations. However, glucose levels following an oral glucose tolerance test (OGTT) may remain comparable between obese and normal-weight women with GDM. Women with OWO and GDM often require more intensive glucose-lowering treatment. Obese pregnant women generally need higher daily insulin doses and may require larger doses of metformin or combined treatment with insulin and metformin. Furthermore, elevated BMI and fasting glucose concentrations are associated with an increased likelihood of metformin monotherapy failure.

The coexistence of obesity and GDM further increases the risk of excessive fetal growth, particularly among women requiring pharmacological treatment. Other associated complications include cesarean delivery, reduced neonatal Apgar scores, and neonatal hospitalization.

Women with previous GDM also face an increased risk of developing type 2 diabetes mellitus and experiencing GDM in subsequent pregnancies. Recurrence occurs in approximately 50% of cases, with contributing factors including higher BMI, previous insulin therapy, fetal macrosomia, and elevated fasting glucose or HbA1c levels. These findings emphasize the importance of early screening, individualized glycemic management, and continued metabolic monitoring.

B. Preeclampsia (PE)

Maternal obesity is a known risk factor for the development of preeclampsia (PE) and a condition that causes both maternal and fetal morbidity. Some metabolic abnormalities associated with obesity, such as the mitochondrial dysfunction or oxidative stress may play a role in its pathogenesis.

Several markers of maternal adiposity have been linked to higher PE risk such as prepregnancy BMI, amounts of visceral and subcutaneous fat, waist

circumference, waist-to-hip ratio and gestational weight gain.

An effective method of preventing PE in women at risk includes taking low dose aspirin. But the optimum dosage for obese pregnant women is still being studied. Higher doses of 162 mg may have possible other preventive benefits which have been suggested in some newer studies; additional proof is needed to determine the optimal doses of acetaminophen. In addition, other methodologic interventions such as intervention for weight gain during pregnancy and pre-pregnancy bariatric surgery in certain women with severe obesity have been considered effective options to prevent obesity in children.

The ratio of soluble FMS-like tyrosine kinase-1 to placental growth factor (sFlt-1/PlGF) is common for the diagnostic evaluation of suspected PE. Some studies suggested that there was an inverse relationship between sFlt-1 concentrations and maternal BMI, but there are currently not enough studies to provide obesity-specific diagnostic cut points. Thus, the validity of the set threshold for sFlt-1/PlGF could be maintained in those with obesity during pregnancy.

Maternal OWO enhances the risk of GDM as well as PE, early identification of risks, individual antenatal care and monitoring, adequate prevention, and timely clinical interventions should be implemented to optimise both maternal and neonatal outcomes.

## V. RISKS OF OVERWEIGHT AND OBESITY IN FETAL CARE

### *A. Fetal Overgrowth: Macrosomia and Large for Gestational Age (LGA)*

Maternal overweight/obesity is correlated with the risk of having excessively large babies, specifically macro-somia and large for gestational age (LGA). Macrosomia is generally considered to be a birth weight ≥ 4000 g, although others have looked at ≥ 4500 g. Based on birth weight, macrosomia may be classified into Class I (4000–4499 g), Class II (4500–4999 g), and Class III (≥5000 g). On the other hand, infants who are born heavier than the 90th percentile for infants born at their given gestational age are classified as LGA. Fetal overgrowth has multiple associations such as maternal obesity, pre-existing diabetes, gestational diabetes mellitus (GDM), previous macrosomic delivery, prolonged pregnancies, and male fetal sex. However, the obesity-induced insulin resistance and placental dysfunction can lead to a greater transfer of nutrients to the fetus, allowing the fetus to grow and develop more fat. obsese babies tend to be larger and fatter, studies show, than normal-weight babies. Maternal pre-pregnancy BMI and placental weight are important determinants of these outcomes.

### *B. Fetal Malformations*

Obesity has been linked to an increased risk of congenital defects notably neural tube defects, congenital heart defects, and orofacial defects in the baby.

There are studies showing that infants born to obese women were more likely to be born with anencephaly or encephalocele or spina bifida defects than infants born to normal weight women. However, folic acid supplementation has been shown to prevent many neural tube defects, but among obese women, increased risk has been noted despite fortification with folic acid.

Obesity, GDM, hypertension and preexisting diabetes are other metabolic disorders associated with maternal metabolism that have been associated with congenital heart defects as well. The association is especially strong in pregnancies complicated with early onset preeclampsia (EoPE), pregestational diabetes and fetal deaths. Additionally, congenital heart defects seem to increase in relation to mother's weight at birth (BMI). The increased risk of cleft palate with or without cleft lip is also linked to severe maternal obesity.

### *C. Stillbirth*

Maternal BMI is also an important risk factor and risk increases with the severity of obesity. Evidence points towards severe obese women being 1.5 times more likely to have a still birth than overweight women. The increase in stillbirth rate is seen throughout pregnancy with highest association to BMI near term. Female BMI values of ≥50 kg/m2 have been reported as having a 5.7-fold and 13.6-fold higher risk of stillbirth at 39 weeks and 41 weeks respectively than reference BMI categories. Also, obesity has been linked to about 25% of stillbirths at 37-42 weeks of pregnancy. All these suggest the need for personalised antenatal surveillance in women with obesity, to ensure pregnancy complications are spotted early and delivery planned appropriately.

*D. Preterm Birth*

Maternal obesity is also linked to an increased risk for preterm birth (both spontaneous and potentially due to some maternal or fetal problem). Chronic inflammation is believed to be a significant factor but not fully understood in obesity. Pregnant women with higher levels of inflammatory activity and metabolic disturbances may be at a greater risk for pregnant complications and premature delivery. In general, maternal OWO has been linked to a number of negative foetal outcomes such as overgrowth, congenital disorders, stillbirth, and early delivery. For women who have overweight or obesity, considerations of early risk assessment, appropriate fetal monitoring and personalized antenatal management are all important in improving pregnancy outcomes.

## VI. CHALLENGES IN PRENATAL CARE ASSOCIATED WITH MATERNAL OBESITY

Ultrasonography, especially transabdominal sonograph, is fundamental diagnostic technique of fetal growth, development and to detect the structural faults. But the quality and accuracy of ultrasound imaging may be considered largely to be influenced by maternal overweight and obesity (OWO). When the fetal structures are further away from the ultrasound probe (due to increased abdominal adipose tissue), more ultrasound waves are absorbed, scattered or modified. As a result, image resolution reducing fetal anatomical assessment becomes more challenging and there is a potential risk of undetected congenital abnormalities.

The association between maternal obesity and ultrasound quality is known, however evidence is limited on a large scale. Monitoring for major fetal anomalies linked to long-term disability was documented by routine first or second trimester ultrasound in only 27.3% vs 46.3% of women who were obese with normal BMI. Likewise, Yaqub et al. found that the higher the maternal BMI, a higher number of imaging failures according to the standards of quality in fetal ultrasound images.

Valuable fetal structures such as the cavum septi pellucidi, which is an indicator of normal brain development, the fetal head, abdomen and femur are especially affected. Such anatomic measurements are important when assessing fetal growth and detecting developmental abnormalities. Hence, women with obesity should be counselled on potential limitations of routinely used prenatal ultrasound techniques under the guise of this.

A number of imaging strategies have been suggested to enhance fetal imaging in pregnancies complicated by obesity. Lower frequency ultrasound waves might provide better tissue-penetration and aid to better complete fetal anatomical assessments. Transvaginal ultrasonography in the second trimester of pregnancy, especially between 20th and 23rd weeks of gestation, may help in better visualisation of selected fetal structures.

In addition, using alternate acoustic 'windows' (such as the umbilical window, the suprapubic window and the bilateral iliac window) may provide visual access to better images of the fetal anatomical structures.

In conclusion, maternal obesity can be a significant issue in prenatal imaging, and proper handling of this condition requires attention to suitable imaging modalities, individual assessment, and effective communication with the patient regarding the benefits and limitations of fetal imaging, and the timely detection of fetal abnormalities.

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## VIII. DISCUSSION

In this narrative review, OWO and its multidimensional consequences for pregnancy are examined, emphasizing four key interrelated areas: Physiological changes, maternal and fetal complications, challenges in prenatal care and pre-conception period intervention. This review represents a different approach to previous ones that focus on individual complications; an integrated overview of clinically relevant considerations from preconception to childbirth is given. The effects of OWO in the mother may not only have a lasting effect on maternal and fetal health during pregnancy, but may also affect maternal and foetal health in the long term.

A lot of interventions are designed and used during or after the first trimester of pregnancy before and after the placenta and fetus may have been exposed to unfavorable metabolic environment. It has been suggested that changes in the functional and genetic regulation of the placenta can happen even prior to any structural or clinical alterations and can be associated with obesity.

Therefore, metabolic abnormalities, such as insulin resistance, lipid metabolism, inflammatory processes, oxidative stress and excess adiposity, are of special concern before the onset of pregnancy. Women with OWO planning for pregnancy should be offered appropriate weight management and preconception counseling. Where and when selected and timed suitably, interventions like lifestyle modification, glucagon-like peptide-1 receptor agonists (GLP-1 RAs) and bariatric surgery may benefit.

Either way, it is important to note that significant amount of weight-loss is not required and being able to lose 5% of weight may be enough to affect metabolic conditions / pregnancy outcomes of obesity. Review mainly focused on prenatal management, but not only this, maternal obesity also has effects during childbirth and postpartum such as prolonged labor, unsuccessful trial of labor, postpartum infections and venous thromboembolism.

Additionally, OWO women are at elevated risk of excess weight retention during the postpartum period, type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD). Unfortunately, children of obese mothers also may be at an increased risk to become obese and develop cardiometabolic diseases in childhood. The authors' conclusions highlight the importance for public health of tackling maternal overweight as a public health problem, in addition to an important clinical problem. Making accessible, affordable, and evidence-based risk assessment, preconception counseling, and preventive interventions a routine part of health care may help minimize intergenerational transmission of obesity and enhance long-term maternal and child health. This Review may have some limitations. Selection and interpretation bias can be introduced in the narrative approach, and variations/reliability of study designs

and methodologies may limit the generalizability of results. Furthermore, most of the included studies were observational in nature, making it difficult to draw clear conclusions with regard to causality between OWO and pregnancy outcomes.

## IX. CONCLUSION

Overweight and obesity in mothers can have a significant impact on the pregnancy by metabolic disturbances, complications and difficulties in assessing and managing the pregnancy for both mother and child. There is a growing prevalence of obesity among women of reproductive age, so preconception counselling and early pregnancy risk identification, as well as proper management of weight and individualised care for pregnancies, are essential to improve pregnancy outcomes.

Improving preventive healthcare measures and offering interventions that are both available and easy to access can help ensure the health of the mother and fetus and decrease metabolic outcomes in the long-term. There is a need for healthcare providers, researchers and policymakers to pay attention and aim to lower the growing global burden of obesity and to its intergenerational effects.

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