JMS

Journal of Morphological Sciences

JMS2025; Vol8 (2):180-185
UDK: 613.25:618.3-06(497.7)"2020/2025"

THE IMPACT OF MATERNAL OBESITY ON PREGNANCY – A REVIEW ARTICLE

Maja Pejkovska Ilieva[1]
[1]University Clinic for Gynecology and Obstretics, Faculty of Medicine, "Ss. Cyril and Methodius" University in Skopje, North Macedonia

Abstract

Maternal obesity has been estimated as a global epidemic, affecting 40% of pregnant women in developed nations. The weight of females that are pregnant has become one of the most concerning points in the modern obstetrics. For this matter after consulting the most accurate literature from academic books in the field and from internet sources from the year 2020 until the year 2025 available on PubMed, Scopus, Data of Science, Google Scholar, ResearchGate, Academia and others we have created a review article that takes in consideration the impact of maternal obesity on the pregnancy itself.

Women may have been obese before becoming pregnant or they may have rapidly gained weight during pregnancy and the types of maternal obesity have their challenges for the pregnancy outcome. The maternal obesity must be carefully treated since it is directly responsible for the impact on gestational diabetes mellitus (GDM), hypertensive disorders, and various perinatal complications. By analyzing the types of maternal obesity and complications that occur during pregnancy we take care not only for the current health of the pregnant mothers and their babies but also of their future to take preventive measures, lifestyle changes and thus to improve their health and the health of their babies.

Key words: maternal obesity, pregnancy outcome, diabetes mellitus, hypertension, perinatal complications.

Introduction

In the last two decades it has been insisted on the urge of the mothers to eat healthy, take their vitamins and supplements so that before and during pregnancy they will be focused on the preventive aspects on keeping their health and the health of their offspring. However still unfortunately it has been observed through literature data that maternal obesity has risen throughout the years making it challenging for the medical staff to ensure safety protocols using all the equipment and knowledge so that a pregnancy is finished in the right course. Epidemiological studies conducted enrolling pregnant women have foreseen that 40% of the obesity is in this group of patients.[1]

The World Health Organization conducted a systematic review regarding the causes and consequences of obesity with designating factors on how to predict obesity, since its impact has been profound in 30% of the pregnant women.[2]

The maternal obesity significantly affects the maternal metabolism and offspring development. It disrupts insulin resistance, glucose homeostasis, fat oxidation, and amino acid synthesis, contributing to adverse outcomes. Lifestyle modification is an effective strategy to improve maternal metabolism and prevent complications.[3]

Since the weight has always been of very high importance for the health of pregnant women, studies conclude that pregnant women with obesity are at greater risk of complications during pregnancy, peripartum and post-partum, compared to women with healthy BMI. It has been proven that worldwide data demonstrating the changes in trends of maternal overweight and obesity prevalence informs service development to address maternal obesity, while directing resources to areas of greatest need evaluating global temporal changes in prevalence of maternal obesity and overweight/obesity, and comparing trends between regions.[4]

Also web sites of Gynecology and Obstetrics Clinics offer patients information on how to measure the Body Mass Index (BMI) and what kind of complications can be expected from the excess amount of body fat. The Mayo Clinic for example explains on their updated web cite that having a high BMI during pregnancy raises the risk of various health conditions, including loss of a pregnancy due to miscarriage or stillbirth. Then diabetes during pregnancy, also called gestational diabetes is one of the most common complications. Preeclampsia is also expected frequently, in which a pregnant person has

high blood pressure. Obese pregnant women also may have signs of damage to the kidneys or other organs. Another serious condition, obstructive sleep apnea can be expected. The need for surgery rises for a caesarean (C) section to deliver a baby that raises health concerns linked to a C-section such as wound infections.[5]

Having a high BMI during pregnancy has been linked to higher risks of various health conditions for a baby, including fetal growth restriction, congenital anomalies, fetal macrosomia, childhood asthma, childhood obesity, trouble with thinking, learning, memory, judgment or decision-making, and developmental delays.[6]

Literature review article has found that maternal obesity raises fetal birth weight and affects neonatal resuscitation by increasing the need for respiratory support and other medical complications.[7]

Purpose

This review article is designated to evaluate the impact of maternal obesity on the pregnancy for both mothers and their infants. For this matter the most accurate literature from academic books in the field and from internet sources from the year 2020 until the year 2025 available on PubMed, Scopus, Data of Science, Google Scholar, ResearchGate, Academia and others have been consulted. We have created a review article that takes in consideration the impact of maternal obesity on the pregnancy itself known to increase the risk of various complications for mothers and additionally, it has significant implications for neonatal health. The information obtained are of high importance to improve the outcome for both mothers and their babies.

Material and methods

For this review article after consulting the most accurate literature from academic books in the field and from 145 internet sources from the year 2020 until the year 2025 available on PubMed, Scopus, Data of Science, Google Scholar, ResearchGate, Academia and other medical sites we have chosen 20 references and created a review artricle that takes in consideration the impact of maternal obesity on the pregnancy itself.

The inclusion criteria prioritized large-scale clinical studies and meta-analyses published within the last five years (2020-2024) that specifically addressed maternal obesity (BMI ≥30) and its obstetric consequences. We employed a narrative synthesis approach to examine both quantitative and qualitative findings across these studies, allowing for a more nuanced understanding of the complex relationships between maternal metabolic status and pregnancy outcomes. Particular attention was given to studies that offered longitudinal data or innovative interventions, ensuring our review captures both established knowledge and emerging trends in this field.

Results and discussion

From the material and methods used there are many studies, articles and books written on this topic. Trying to be up to date as possible in the field of modern obstetrics the most accurate results are represented and discussed in this review article.

Leung TY et al. included overall, data from 49,009,168 pregnancies in their meta analysis. From the 121 study cohorts presented in the included studies, the majority were European populations (n = 71), with 23 cohorts in North America, 12 cohorts in South America, ten from Australia and Oceania, and five from Asia. No studies were found representing populations from Africa. The included study cohorts represented the populations from 25 different countries, with two studies having taken place in high income countries, according to the World Bank definition.[8,9,10]

Johanson Kari et al. in their cohort study comprised out of 15 760 pregnancies with obesity, followed up for a median of 7.9 years (IQR 5.8–9.4), showed that 11 667 (74.0%) pregnancies had class I obesity, 3160 (20.1%) had class II obesity, and 933 (5.9%) had class III obesity. The author found that among these pregnancies, 1623 (13.9%), 786 (24.9%), and 310 (33.2%), respectively, had gained weight during pregnancy below the lower limit of the Institute Of Medicine (IOM) recommendation (5 kg).

In pregnancies with class I or class II obesity, gestational weight gain values below the lower limit of the IOM recommendation or weight loss did not increase the risk of the adverse composite outcome according to the authors (eg, at weight gain z-score –2.4, corresponding to 0 kg at 40 weeks:

adjusted RR 0.97 [95% CI 0.89–1.06] in obesity class I and 0.96 [0.86–1.08] in obesity class II). In pregnancies with class III obesity, weight gain values below the IOM limit or weight loss were associated with reduced risk of the adverse composite outcome (eg, adjusted RR 0.81 [0.71–0.89] at weight gain z-score –2.4, or 0 kg.[11]

Mohammed et al. in their review article cite that, compared to normal weight, the odds ratio of of Gestational Diabetes Mellitus (GDM) was 2.2, 4.0, 5.8, and 7.6 in women with overweight, obesity class I, II, and III, respectively. Furthermore, the authors have found that gestational weight gain might tip off the subcutaneous storage capacity of some women, leading to insulin resistance or exacerbation of a pre-existing insulin resistance state and hence increasing the risk (GDM).Within weight classes, the higher the gestational weight gain, the higher the risk of GDM. Compared to women of normal BMI who had a normal weight gain, the odds of GDM were 4.4, 5.1, and 7.8 in obese women with low, adequate, and high gestational weight gain, respectively.[12]

Garovic et al. and Poon et al. showed that hypertensive disorders in obese pregnancies were addresses to age-related changes in the association between Hypertensive Disorders in Pregnancy (HDP) history and hypertension and dietary and nutritional changes. Although the difference was not statistically significant a history of HDP for hypertension were higher in the 30s–50s group than in the 60s and older group. This may have been because of the processes of aging, menopause, and declining estrogen levels that play an important role in endothelial dysfunction and oxidative stress, resulting in hypertension in older women, which is why women must pay meticulous attention to their diet, nutrition and lifestyle changes.[13,14]

A cross sectional analysis by Wagata et al. came to results that the prevalence of hypertension in women with a history of HDP was almost 16%, even for women in their 30s. Therefore, continuous follow-up immediately after the postpartum period is important for women with a history of HDP to enable early detection of hypertension. This follow-up could take the form of aperiodic health examination and home blood pressure measurement.[15]

Poniedziałek-Czajkowska explains that obesity adversely affects pregnancy and obstetric outcomes. The risk of preeclampsia (PE) is two times higher with a maternal BMI of 26 kg/m2 and as much as three times higher with a BMI > 30 kg/m2. There are few studies on the effect of the exercise intensity and duration on the risk of developing PE. She cites a meta-analysis published by Aune et al. aimed to assess the dose–response relationship between physical activity and the risk of PE. The authors have found a 28% reduction in the PE risk for every 1 h of exercise per day (RR = 0.72; 95% CI: 0.53–0.99; 3 studies) and 22% for every 20 metabolic equivalents of task (MET)-hours/week increment (RR = 0.78: 95% CI: 0.63–0.96; 2 studies).

It was found that the maximum risk reduction has been proven for an activity lasting 5–6 h per week, and no further reduction was observed with an increasing training time. Furthermore, the authors of this report have observed that exercise performed in early pregnancy linearly reduced the PE risk by 17% for each 1 h/day increment in physical activity (RR = 0.83; 95% CI: 0.72–0.95; 7 studies) and by 15% for every 20 MET-hours/week increment (RR = 0.85; 95% CI: 0.68–1.07; 3 studies).[16]

Nivedita et al. explained that globally obesity is increasing especially in the reproductive age group but pregnant women with obesity have higher complication and intervention rates. The authors claim that obesity is an independent risk factor for pregnancy complications including diabetes, hypertension and macrosomia and those with these complications, have the timing of delivery often influenced by the severity of the complication.

Population based observational studies in obese women have shown an increase in the risk of stillbirth that increases linearly with weight from overweight through to class II obesity, but then rises sharply in those with class III obesity by at least 10-fold beyond 42 weeks when compared to normal weight women. Is is found that the risk of stillbirth is notably higher in obese women from 34 weeks onwards compared to normal weight women. Also, one modifiable risk factor for stillbirth as shown from various cohorts of pregnant women is prolonged pregnancy and even though the exact mechanism is yet unknown some have linked this to maternal dysregulation of the hypothalamic pituitary adrenal axis leading to hormonal imbalance delaying parturition.[17]

For women with obesity there exist two dilemmas when and how best to deliver. For class I obese women it was stated that there are no differences in outcome with regards to timing and mode of delivery when compared to lean weight women. However, for class II and III obesity, planned induction or caesarean sections may be associated with a lower perinatal morbidity and mortality although this

may be associated with an increased maternal morbidity especially in class III obesity. The authors said that studies have shown that delivery by 39 weeks is associated with lower perinatal mortality compared to delivering after in these women. On balance the evidence would favour planned delivery (induction or caesarean section) before 40 weeks of gestation. In the morbidly obese, apart from the standard lower transverse skin incision for CS, there is evidence that a supraumbilical transverse incision may reduce morbidity but found less cosmetic. However, irrespective of the option adopted, it is important to discuss the pros and cons of each.[17]

Horwood et al. performed a large population-based retrospective cohort study for a period of six years, that included 27472 nulliparous women. They had obesity planned mode of delivery included waiting for spontaneous labor, a plan for induction of labor, and planned non-labor cesarean section that planned non-labour caesarean section (NLCS) associated with reduced risk of overall, maternal-specific, and neonatal-specific adverse outcome index (AOI) by 41% (adjusted risk ratio [aRR]: 0.59, 95% confidence interval [CI]: 0.50–0.70), 54% (aRR: 0.46, 95% CI: 0.35–0.60), and 30% (aRR: 0.70, 95% CI: 0.57–0.87) respectively when compared to spontaneous labor at term gestation.

The authors confirmed that there was no statistically significant difference in overall AOI when comparing planned induction of labor to spontaneous labor (aRR: 1.03, 95% CI: 0.96–1.10) and that among women with obesity, NLCS may be considered as an option for planned mode of delivery due to the decreased adverse outcome index (AOI) risk. However, Horwood et al. said that further research on the association between NLCS and severe outcomes is needed.[18]

Literature states that gaining a lot of weight during pregnancy can contribute to the risk of shoulder dystocia, even in women who were not previously obese. Significant weight gain can lead to a larger baby, which increases the chances of the baby's shoulders becoming lodged during delivery. Medical providers should support and educate expectant mothers about healthy weight gain during pregnancy.[19]

Kim explains that obesity in pregnancy is associated with fetal and neonatal complications. There persists multiple mechanisms responsible for the adverse outcomes associated with maternal obesity, but increased insulin resistance, inflammation, and oxidative stress associated with obesity can take part in early placental and fetal dysfunction. The author cites studies that obese women had an increased incidence of miscarriage and stillbirth compared to women with normal weight. It has also been shown there is a several-fold increased incidence of perinatal complications, congenital anomalies such as spina bifida, omphalocele, and cardiac defects in obese pregnant women.

It was confirmed that, neural tube defects persisted in obese women despite consuming a diet fortified with folic acid. Macrosomia, or large for gestational age (LGA), was another neonatal complication associated with obesity in pregnancy and the risk for operative delivery, poor delivery outcomes, and maternal and infant traumatic injuries is increased. This condition has association with maternal complications such as protracted or arrest of labor, uterine rupture, genital tract lacerations, and/or postpartum hemorrhage. Neonates that are LGA have an increased risk of shoulder dystocia, clavicular fractures, brachial plexus injuries, and nerve palsies.[20]

Conclusion

Many therapists in the scientific community have written about obesity and pregnancy. It is a very accurate topic and maternal obesity must be carefully treated since it is directly responsible for the impact on gestational diabetes mellitus (GDM), hypertensive disorders, preeclampsia and various perinatal complications. By analyzing and recognizing the types of maternal obesity and complications that occur during pregnancy and the perinatal complications, we take care not only for the current health of the pregnant mothers and also for their babies.

Maternal obesity profoundly affects pregnancy, increasing short- and long-term risks for mothers and children. Proactive care, including weight management and close monitoring, is essential to mitigate these risks.

References

1. World Health Organization. Obesity. https://www.who.int/health-topics/obesity#tab=tab_1 (accessed 1 Oct 2021)
2. Safaei M, Sundararajan EA, Driss M, Boulila W, Shapi'i A. Comput Biol Med. A systematic literature review on obesity: understanding the causes & consequences of obesity and reviewing various machine learning approaches used to predict obesity. 2021;136 doi: 10.1016/j.compbiomed.2021.104754. [DOI] [PubMed] [Google Scholar][Ref list]
3. Nelson SM, Matthews P, Poston L (2010). "Maternal metabolism and obesity: modifiable determinants of pregnancy outcome". Human Reproduction Update. 16 (3): 255–75. doi:10.1093/humupd/dmp050. PMC 2849703. PMID 19966268
4. Kent, L., McGirr, M., & Eastwood, K.-A. (2024). Global trends in prevalence of maternal overweight and obesity: a systematic review and meta-analysis of routinely collected data retrospective cohorts. International Journal of Population Data Science, 9(2), Article 6. https://doi.org/10.23889/ijpds.v9i2.2401
5. https://www.mayoclinic.org/healthy-lifestyle/pregnancy-week-by-week/in-depth/pregnancy-and-obesity/art-20044409#:~:text=How%20might%20a%20high%20BMI,section%20such%20as%20wound%20infections.
6. Abdi, F., Alizadeh, S., Roozbeh, N. et al. Prepregnancy overweight and obesity and the risk of adverse pregnancy outcomes. Sci Rep 15, 16846 (2025). https://doi.org/10.1038/s41598-025-02113-9
7. Maternal obesity: perinatal implications. Reed J, Case S, Rijhsinghani A. SAGE Open Med. 2023;11 doi: 10.1177/20503121231176128. [DOI] [PMC free article] [PubMed] [Google Scholar][Ref list]
8. Abrams BF, Leonard SA, Kan P, Lyell DJ, Carmichael SL. Interpregnancy weight change: associations with severe maternal morbidity and neonatal outcomes. Am J Obstet Gynecol MFM 2022; 4: 100596 10.1016%2Fj.ajogmf.2022.100596
9. Heslehurst N, Vinogradov R, Nguyen GT, et al. Study of How Adiposity in Pregnancy has an Effect on outcomeS (SHAPES): protocol for a prospective study. BMJ Open 2023;13(9):e073545 10.1136/bmjopen-2023-073545
10. The World Bank W. High income | Data. https://data.worldbank.org/country/XD (accessed 1 Oct 2021
11. Johansson, Kari et al. Safety of low weight gain or weight loss in pregnancies with class 1, 2, and 3 obesity: a population-based cohort study. The Lancet, Volume 403, Issue 10435, 1472 – 1481
12. Mohammed Bashir, Yassin Fagier, Badreldeen Ahmed, Justin C Konje,An overview of diabetes mellitus in pregnant women with obesity, Best Practice & Research Clinical Obstetrics & Gynaecology, Volume 93, 2024,102469, ISSN 1521-6934,https://doi.org/10.1016/j.bpobgyn.2024.102469.(https://www.sciencedirect.com/science/article/pii/S1521693424000154)
13. Garovic VD, Dechend R, Easterling T, et al. Hypertension in pregnancy: diagnosis, blood pressure goals, and pharmacotherapy: a scientific statement from the American Heart Association. Hypertension. 2022; 79(2): e21-e41.View CAS PubMed Web of Science®Google Scholar
14. Poon LC, Magee LA, Verlohren S, et al. A literature review and best practice advice for second and third trimester risk stratification, monitoring, and management of pre-eclampsia. Int J Gynecol Obstet. 2021; 154: 3-31.
15. Wagata, M., Kogure, M., Nakaya, N. et al. Hypertensive disorders of pregnancy, obesity, and hypertension in later life by age group: a cross-sectional analysis. Hypertens Res 43, 1277–1283 (2020). https://doi.org/10.1038/s41440-020-0463-8
16. Poniedziałek-Czajkowska, E.; Mierzyński, R.; Leszczyńska-Gorzelak, B. Preeclampsia and Obesity—The Preventive Role of Exercise. Int. J. Environ. Res. Public Health 2023, 20, 1267. https://doi.org/10.3390/ijerph20021267

17. Nivedita R. Aedla, Tahir Mahmood, Badreldeen Ahmed, Justin C. Konje, Challenges in timing and mode of delivery in morbidly obese women, Best Practice & Research Clinical Obstetrics & Gynaecology, Volume 92, 2024, 102425, ISSN 1521-6934, https://doi.org/10.1016/j.bpobgyn.2023.102425.(https://www.sciencedirect.com/science/article/pii/S1521693423001323
18. Horwood, G., Erwin, E., Guo, Y. et al. Risk associated with planned mode of delivery in women with obesity: a large population-based retrospective cohort study. Int J Obes 49, 835–843 (2025). https://doi.org/10.1038/s41366-024-01709-x
19. https://www.beamlegalteam.com/blog/maternal-risk-factors-for-shoulder-dystocia/
20. Kim J, Ayabe A. Obesity in Pregnancy. [Updated 2023 Aug 8]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK572113/