



OPEN ACCESS

EDITED BY
Arjan Te Pas,
Leiden University, Netherlands

*CORRESPONDENCE
Rubia Khalak
khalakr@amc.edu

SPECIALTY SECTION
This article was submitted to Neonatology, a
section of the journal Frontiers in Pediatrics

RECEIVED 12 September 2022
ACCEPTED 20 September 2022
PUBLISHED 05 October 2022

CITATION
Horgan MJ, Khalak R and Rijhsinghani A (2022)
Editorial: Maternal obesity's impact on the
mother and neonate.
Front. Pediatr. 10:1042659.
doi: 10.3389/fped.2022.1042659

COPYRIGHT
© 2022 Horgan, Khalak and Rijhsinghani. This is
an open-access article distributed under the
terms of the [Creative Commons Attribution
License \(CC BY\)](#). The use, distribution or
reproduction in other forums is permitted,
provided the original author(s) and the
copyright owner(s) are credited and that the
original publication in this journal is cited, in
accordance with accepted academic practice.
No use, distribution or reproduction is
permitted which does not comply with these
terms.

Editorial: Maternal obesity's impact on the mother and neonate

Michael J. Horgan¹, Rubia Khalak^{1*} and Asha Rijhsinghani²

¹Department of Pediatrics, Albany Medical College, Albany, NY, United States, ²Department of
Obstetrics and Gynecology, University of Washington, Seattle, WA, United States

KEYWORDS

maternal obesity, maternal obesity and antenatal care, gestational diabetes, gestational
hypertension, hypoxic ischaemic encephalopathy, neonatal respiratory distress, neonatal
hospitalization costs

Editorial on the Research Topic

Maternal obesity's impact on the mother and neonate

By Horgan MJ, Khalak R, Rijhsinghani A. (2022) Front. Pediatr. 10: 1042659. doi: 10.3389/
fped.2022.1042659

Introduction

The continued rise in maternal obesity regardless of age or socioeconomic background has become a relentless problem worldwide. More women are obese at their first prenatal visit, then subsequently gaining more weight during pregnancy than ever before. Maternal obesity has been shown to compromise not only the health of the mother, but also that of the neonate. Pregnant women with co-morbidities who also have obesity face a much greater risk of worsening of their underlying disease while pregnant. Maternal obesity has been noted to increase the inflammatory response of organs such as the placenta with subsequent downstream effects on the fetus. Although there is literature that currently exists on maternal complications from obesity and to some degree concerning the neonate, aspects of infant outcomes associated with maternal obesity remains limited. Long term effects of obesity on mothers and later childhood effects on their offspring are minimally seen in the literature.

The aim of this special issue of Frontiers in Neonatology Research Topic “*Maternal Obesity's Impact on the Mother and Neonate*” is to present the available knowledge of the impact of maternal obesity on the health of the mother and infant and showcase original work done in the field to address areas where a paucity of literature continues to exist.

Overview of maternal obesity, management, and placental pathology

With the ever-increasing incidence of people with obesity, a mirrored increase in maternal obesity has also been noted, particularly in developed countries (1, 2). As

more women are diagnosed with obesity, the rates of antepartum, intrapartum and postpartum complications and adverse effects on the neonate have been reported in the literature (3, 4).

Several research groups have found an association of increased incidence of gestational diabetes, gestational hypertension, and the need for Cesarean delivery (5, 6). Researchers have noted increased rates of intrapartum infection, preterm delivery, prematurity, congenital anomalies, stillbirth and severe hypoxic ischemic encephalopathy (HIE) in infants of mothers with obesity (5–9). Guidelines for the care of mothers with obesity have been recommended by the American College of Obstetrics and Gynecology (10). In this issue, Sterrett et al. provide a comprehensive overview of the considerations that should be undertaken when providing care to a pregnant woman with obesity or with super-morbid obesity. The authors describe the antepartum and intrapartum concerns of increased risks such as hypertension, diabetes, and pre-eclampsia. They also present the increased surgical risks and importance of being aware of the availability of additional supports at a particular facility prior to delivery. Also in this *Frontiers* issue is a review by Monaco-Brown and Lawrence of the how obesity can act as a stressor on the pregnant mother. The subsequent inflammatory and cytokine changes have downstream effects that can bring about changes in placental structure and function. These changes can result in the comorbidities that are often associated with maternal obesity.

Neonatal impact on infants of mothers with obesity and economic costs

Maternal morbidities secondary to obesity have been shown to have an impact on the infant. Some of these effects can manifest in both the immediate and early newborn period. Researchers have proposed that the changes in the intrauterine environment increase the risk for delayed fetal lung maturity leading to increased rates of transient tachypnea of the newborn (TTN) and respiratory distress syndrome (RDS) (11, 12). Findings of neonatal hypoglycemia have also been associated with maternal diabetes and maternal obesity (13). Kureshi et al. present in this issue their investigation of respiratory transition diagnoses and hypoglycemia in neonates born to mothers with obesity. The researchers found that infants born to mothers with obesity were more likely to have diagnoses of TTN, RDS and hypoglycemia in the early newborn period.

Villamor et al. found that there was an increased risk of neonatal complication of asphyxia or HIE with lower Apgar scores seen in neonates born to mothers with diabetes and obesity (14). A brief report from our center showed an association of maternal obesity and HIE (15). In this issue, Monaco-Brown et al. present their findings from a population-based cohort study using regional data. They looked at whether

infants born to mothers with obesity were at higher risk of developing HIE. In their analyses of over 97,000 pregnancies, they found that infants born to mothers with obesity were more likely to have a lower 5-minute Apgar score and more likely to receive the diagnosis of HIE. An increased treatment with therapeutic hypothermia in these infants was also noted.

Despite research on maternal obesity and the impact on the neonate, the effect on healthcare costs has had minimal study. Kim et al. showed in a meta-analysis review that obesity and its' comorbidities attributed to almost one third of the medical costs of the hospitalized patient with obesity (16). From a data set of Florida's healthcare charge costs, Whiteman et al. in a 2015 study concluded that infants born to mothers with obesity had higher in-patient hospital costs when compared to infants of non-obese mothers (17). Presented here, Azher et al. assessed whether hospital care costs were greater for mothers with obesity, and their infants during the neonatal period. The authors found an increase in healthcare costs, and greater length of stays for both mothers with obesity and their infants.

Conclusion

The compilation of articles in this *Frontiers* issue broadly encompasses the available literature on the topic of maternal obesity and its impact on the neonate. We hope that readers will have a sense of not only what has been studied but also be able to identify areas of future study such as the long-term effects of maternal obesity on both the mother and child.

Author contributions

All authors listed contributed to the editorial and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

1. Arroyo-Johnson C, Mincey KD. Obesity epidemiology worldwide. *Gastroenterol Clin North Am.* (2016) 45:571–9. doi: 10.1016/j.gtc.2016.07.012
2. Blüher M. Obesity: global epidemiology and pathogenesis. *Nat Rev Endocrinol.* (2019) 15:288–98. doi: 10.1038/s41574-019-0176-8
3. Poston L, Caleyachetty R, Cnattingius S, Corvalán C, Uauy R, Herring S, et al. Preconceptional and maternal obesity: epidemiology and health consequences. *Lancet Diabetes Endocrinol.* (2016) 4:1025–36. doi: 10.1016/S2213-8587(16)30217-0
4. O'Brien TE, Ray JG, Chan WS. Maternal body mass index and the risk of preeclampsia: a systematic overview. *Epidemiology.* (2003) 14:368–74. doi: 10.1097/01.EDE.0000059921.71494.D1
5. Baeten JM, Bukusi EA, Lambe M. Pregnancy complications and outcomes among overweight and obese nulliparous women. *Am J Public Health.* (2001) 91:436–40. doi: 10.2105/ajph.91.3.436
6. Tsoi E, Shaikh H, Robinson S, Teoh TG. Obesity in pregnancy: a major healthcare issue. *Postgrad Med J.* (2010) 86:617–23. doi: 10.1136/pgmj.2010.098186
7. Cnattingius S, Villamor E, Johansson S, Edstedt Bonamy AK, Persson M, Wikström AK, et al. Maternal obesity and risk of preterm delivery. *JAMA.* (2013) 309:2362–70. doi: 10.1001/jama.2013.6295
8. Persson M, Johansson S, Villamor E, Cnattingius S. Maternal overweight and obesity and risks of severe birth-asphyxia-related complications in term infants: a population-based cohort study in Sweden. *PLoS Med.* (2014) 11:e1001648. doi: 10.1371/journal.pmed.1001648
9. Minsart AF, Buekens P, De Spiegelaere M, Englert Y. Neonatal outcomes in obese mothers: a population-based analysis. *BMC Pregnancy Childbirth.* (2013) 13:36. doi: 10.1186/1471-2393-13-36
10. American College of Obstetricians and Gynecologists. Obesity in pregnancy: aCOG practice bulletin, number 230. *Obstet Gynecol.* (2021) 137:e128–44. doi: 10.1097/AOG.0000000000004395
11. Azad MB, Moyce BL, Guillemette L, Pascoe CD, Wicklow B, McGavock JM, et al. Diabetes in pregnancy and lung health in offspring: developmental origins of respiratory disease. *Paediatr Respir Rev.* (2017) 21:19–26. doi: 10.1016/j.prrv.2016.08.007
12. McGillick EV, Lock MC, Orgeig S, Morrison JL. Maternal obesity mediated predisposition to respiratory complications at birth and in later life: understanding the implications of the obesogenic intrauterine environment. *Paediatr Respir Rev.* (2017) 21:11–8. doi: 10.1016/j.prrv.2016.10.003
13. Mørtier I, Blanc J, Tosello B, Gire C, Bretelle F, Carcopino X. Is gestational diabetes an independent risk factor of neonatal severe respiratory distress syndrome after 34 weeks of gestation? A prospective study. *Arch Gynecol Obstetr.* (2017) 296:1071–7. doi: 10.1007/s00404-017-4505-7
14. Villamor E, Tedroff K, Peterson M, Johansson S, Neovius M, Petersson G, et al. Association between maternal body mass Index in early pregnancy and incidence of cerebral palsy. *JAMA.* (2017) 317:925–36. doi: 10.1001/jama.2017.0945
15. Khalak R, Horgan M. Association of maternal obesity and neonatal hypoxic ischemic encephalopathy. *J Perinatol.* (2020) 40:174–5. doi: 10.1038/s41372-019-0559-7
16. Kim DD, Basu A. Estimating the medical care costs of obesity in the United States: systematic review, meta-analysis, and empirical analysis. *Val Heal.* (2016) 19:602–13. doi: 10.1016/j.jval.2016.02.008
17. Whiteman VE, Salemi JL, Mejia De Grubb MC, Cain MA, Mogos MF, Zoorob RJ, et al. Additive effects of pre-pregnancy body mass index and gestational diabetes on health outcomes and costs. *Obesity.* (2015) 23:2299–308. doi: 10.1002/oby.21222