

# Maternal obesity and its association with neonatal morbidity

## Editorial

The increasing prevalence of obesity in infants, children, and adults, both in the US and worldwide, is an individual and public health problem.<sup>1</sup> The body mass index (BMI), defined as weight in kilograms divided by height in meters squared (kg/m<sup>2</sup>), is the most widely used measure to classify categories of body weight. An adult with a BMI of 18.5-24.9 is considered normal weight, while a BMI of 25.0-29.9 is considered overweight, and a BMI of 30.0 or greater is considered obese see (Table 1). The World Health Organization (WHO) further subdivides obesity into three different classes: obesity class I (BMI 30.00-34.99), obesity class II (BMI 35.00-39.99), and obesity class III (BMI 40.00 or greater).<sup>1</sup> Additional categories within class III obesity have also been proposed, including: “super-obese” (BMI 50.00 or greater) and “super-super-obese” (BMI 60.00 or greater).

According to results from the 2016 US National Health and Nutrition Examination Survey (NHANES) the prevalence of obesity in women was reported to be 40.4% and the corresponding prevalence of class III obesity was 9.9%.<sup>2</sup> More concerning is the finding that among women giving birth in 2014, 24.8% were reported as obese and 25.6% as overweight.<sup>3</sup> This unfortunate trend is further illustrated by the Centers for Disease Control and Prevention (CDC) who reported that obesity among women of childbearing age (18-44 years) increased by almost 30% over the last decade, from 21.7% in 2006 to 27.5% in 2016.<sup>4</sup> Despite the fact that most recently the prevalence of obesity seems to have stabilized in the overall population, the prevalence of class II and class III obesity in reproductive aged women is still on the rise.<sup>5</sup> In short, pre-pregnancy BMI outside the normal range are now at an all time high in reproductive aged women and raise considerable individual and public health concerns.

**Table 1** Body mass index categories

Category	BMI*	Alternative name
Underweight	less than 18.5	
Normal weight	18.5 - 24.9	
Overweight	25.0 - 29.9	pre-obese
Obesity class I	30.0 - 34.9	
Obesity class II	35.0 - 39.9	
Obesity class III	40 or greater	extreme, morbid
	50 or greater	super-obese
	60 or greater	super-super-obese

\*weight in kilogram divided by height in meters square (kg/m<sup>2</sup>).

Over the years, research has demonstrated consistently that maternal obesity and overweight are associated with a higher risk of adverse pregnancy outcomes and higher rates of maternal, fetal, and neonatal morbidity.<sup>6-15</sup> Neonatal morbidity is generally defined as an increase in birth injuries, lower Apgar scores, respiratory distress syndrome, bacterial sepsis, hypoglycemia, neonatal seizures, NICU

Volume 8 Issue 4 - 2018

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**Received:** July 17, 2018 | **Published:** July 18, 2018

admissions, congenital anomalies, and even neonatal death. Morbidity risks are amplified by the degree of maternal obesity and women with a pre-pregnancy BMI outside the normal range are more likely to have infants who experience increased morbidity. This is well documented in a large retrospective study by Scott-Pillai et al.,<sup>6</sup> in which the impact of maternal BMI on maternal and neonatal outcomes in 30,298 singleton pregnancies over an 8-year period in 2004-2011 was investigated. Their research clearly demonstrated a direct relationship between increasing BMI and higher risk of neonatal morbidity. More recently, Kim et al.,<sup>7</sup> reported that women with a delivery BMI of 60 or higher display significantly higher neonatal morbidity than any other cohort of obese women with BMI between 30 and 59. The study was conducted at the University of Minnesota and the Hennepin County Medical Center in Minneapolis, Minnesota and included pertinent deliveries from January 2005 to April 2016. This retrospective, multi-center cohort study investigated neonatal morbidity rates in 338 obese women with singleton pregnancies and delivery BMI ranging from 30 to 82. The primary outcome of the study was composite neonatal morbidity, which was defined as 5-minute Apgar score less than 7, hypoglycemia, respiratory distress syndrome, sepsis, hospital stay greater than 5 days, neonatal intensive care unit admission, or neonatal death. Results demonstrated:

- An overall composite neonatal morbidity rate of 24% in the obese cohort.
- A statistically significant increase in the incidence of composite neonatal morbidity with increasing BMI, with the highest rates among those with BMI 60 or greater (BMI 30-39 [17%], BMI 40-49 [19%], BMI 50-59 [22%] BMI 60 or greater [56%]; P<.001), and
- The adjusted odds of neonatal morbidity to be 4.47 times higher for neonates born to mothers with a BMI 60 or greater as compared to the BMI 30-39 group.

Together, these studies of normal weight, overweight, and obese women of reproductive age show a clear correlation between

increasing maternal BMI and higher neonatal morbidity. In particular, they demonstrate that women at the extreme end of obesity (BMI 60 or higher) display significantly higher neonatal morbidity than any other cohort of obese, overweight, or normal weight women. Given that over 50% of women entering pregnancy are overweight or obese there seems to be a large potential for intervention. Ideally reproductive planning should start well before conception by educating women on the risks associated with entering pregnancy outside a normal (greater than 25) BMI range.<sup>16,17</sup> Preconception counseling should include discussions of the risks that the obese or overweight state provide and the benefit that weight reduction before conception may provide. In cases where a normal BMI cannot be achieved pre-pregnancy it should be stressed that even small weight reductions may improve metabolic health and pregnancy outcomes and at the same time may reduce neonatal morbidity. Obese and overweight women should be counseled first on the benefits of nonsurgical interventions including behavioral modifications, dietary changes, and exercise. Pharmacotherapy for weight management is not recommended during the time of conception or during pregnancy because of safety concerns and potential adverse effects on the fetus. For women with a BMI of 40 or greater, bariatric surgical consultation may also be considered. If pregnancy does occur, it will be just as important to work closely with these women and continue to discuss weight gain and/or loss during pregnancy to reach a delivery BMI that favors lower neonatal morbidity rates.

In all cases, maintaining or achieving a normal and thus, healthier pre-pregnancy body weight will result in a reduced delivery BMI. This, in turn will greatly benefit both, maternal health and pregnancy outcomes. As important, it may ultimately result in a significant reduction of neonatal morbidity.

## Acknowledgements

None.

## Conflict of interest

The author declares there is no conflict of interest.

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