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Short Communication

The Effect of Obesity on Maternal, Fetal and Neonatal Health

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The growing obesity epidemic has become one of the major individual and public health challenges of the 21st century. According to the World Health Organization (WHO), in 2016 more than 1.9 billion adults were overweight (BMI between 25.0 and 29.9), and of these 650 million were obese (BMI 30.0 or greater) [1]. In the United States, the overall prevalence of obesity showed significant increase between 2005 and 2014, with 40.4% of women classified as obese in 2014 [2]. Similarly, obesity among women of reproductive age has continued to increase. Today, the majority of US women enter pregnancy with a BMI outside of the normal range (BMI 18.5 - 24.9). Data provided by the National Vital Statistics System (NVSS) documents that among US women with a live birth in 2015, 25.6% were classified as obese and 25.8% as overweight [3]. Comparison of pre-pregnancy BMI categories between 2011 and 2015 showed a significant shift toward higher weight classes. Over the 5 year time period, a 2% and 8% relative increase were reported for the overweight and obese categories, and a relative increase of 6%, 10%, and 14% were reported for class I (BMI 30.0 - 34.9), class II (BMI 35.0 - 39.9), and class III obesity (BMI 40 or greater), respectively (Figure 1). Strikingly, class III obesity increased more rapidly than either class I or class II obesity. Taken together this data suggests that in the US the prevalence of women who are overweight or obese is at an all time high and is still increasing among women giving birth.

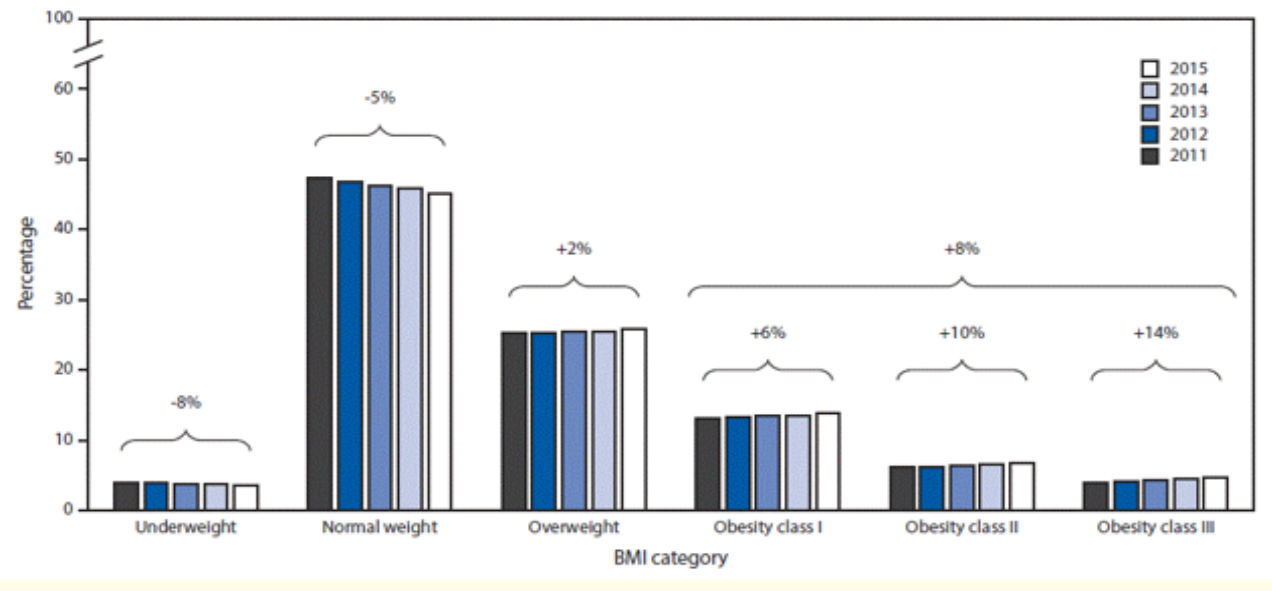

Figure 1: *Prevalences and relative changes in pre-pregnancy BMI categories among US women with a live birth in 2011-2015. Pre-pregnancy BMI was categorized as underweight (BMI < 18.5), normal weight (BMI 18.5 - 24.9), overweight (BMI 25.0 - 29.9), obesity class I (BMI 30.0 - 34.9), obesity class II (BMI 35.0 - 39.9), and obesity class III (BMI ≥ 40.0). Adapted from Deputy., et al [3].*

These findings are significant and of great concern since it is well documented that a BMI above normal, both before and during pregnancy, is associated with increased maternal and neonatal morbidity and mortality [4-6]. In addition, multiple studies linked pre-pregnancy obesity to higher complication rates during and after pregnancy, and to poor maternal, fetal, and neonatal health outcomes [6-13]. Obese and overweight women are at risk of many complications before, during, and after pregnancy. Antenatally, obesity is associated with an increased risk of miscarriage, insulin resistance, gestational diabetes, gestational hypertension, pre-eclampsia, and thromboembolism. It is also well documented that women who are obese before pregnancy are at increased risk for pre-term delivery associated with the corresponding low birth weight and increased infant mortality. Intrapartum risks include poor labor outcomes, with obese women having lower rates of spontaneous onset of labor, increased rates of induction of labor, and increased rates of cesarean sections. Obese women delivering at-term are also at higher risk of giving birth to large-for-gestational-age (LGA) infants and diagnosis of macrosomia occurs more frequently than in women of normal weight. Postpartum, obese women are less likely to breastfeed successfully, have prolonged postpartum hospitalizations, and are at higher risk of postpartum infections. Similarly, infants born to overweight and obese mothers are at higher risk for a variety of adverse neonatal outcomes including stillbirth, birth injury, low Apgar scores, NICU admission, respiratory distress syndrome, bacterial sepsis, hypoglycemia, neonatal seizures, congenital anomalies, and neonatal death. Positive linear relationships have been reported for both increasing total body weight and BMI values, and increasing risk for maternal complications and poor maternal, fetal and neonatal outcomes.

Many studies have now documented that pregnant women who are obese or overweight are at increased risk for a multitude of complications during and after pregnancy and are prone to poor maternal and neonatal outcomes. The risks seem to be amplified with increasing degree of maternal obesity and seem to be most severe in women with class III obesity. This has led to the conclusion that behavioral interventions aimed at reducing maternal weight may result in lower complication rates during pregnancy as well as improved maternal and neonatal morbidity and mortality outcomes.

A careful analysis of the literature reveals that to date most published data linking overweight and obesity during pregnancy to poor maternal and neonatal outcomes were derived from retrospective studies. While retrospective studies provide many valuable insights, they have their limitations. In particular, they do not prove conclusively that interventions resulting in maternal weight loss will ultimately translate into fewer complications during pregnancy and improved maternal and neonatal outcomes. Only randomized, well-powered interventional trials are suited to demonstrate effectiveness and potential clinical benefits of any particular intervention or weight loss regimen. To date, the results of a very limited number of such interventional trials have been reported. The few studies published addressed mainly lifestyle interventions during pregnancy. These studies were, however, mostly underpowered, of small-scale, limited in scope, and addressed one, or a very select few, outcomes. Nevertheless, systematic reviews and meta-analysis of the effects of such interventions on maternal weight and obstetric outcomes seemed to indicate that lifestyle interventions during pregnancy might be an effective means to reduce or prevent select outcomes such as gestational diabetes [14-16]. However, this conclusion was put into perspective by results from the UPBEAT study, a recent multi-center, randomized controlled interventional trial in obese pregnant women [17]. In this study Poston., *et al*. investigated whether a complex intervention addressing diet and physical activity in pregnant women who are obese could reduce the incidence of gestational diabetes and LGA infants. From their results, they concluded that this intervention is not adequate to prevent gestational diabetes or to reduce the incidence of LGA infants. This negative result while disappointing, is not completely unexpected since the intervention commenced around mid-pregnancy at 15 - 18 weeks plus 6 days of gestation only. Notably, data from a recent meta-analysis of interventions to reduce and prevent obesity in women showed that interventions delivered preconception or early in pregnancy have better outcomes on average than did those with interventions later in pregnancy [18].

In conclusion, a vast number of research and retrospective studies have demonstrated consistently that maternal obesity is associated with a higher risk of poor pregnancy, maternal, fetal, and neonatal outcomes. Well-powered, randomized trials will now be required to demonstrate that specific lifestyle interventions in obese women will translate into fewer complications during pregnancy and more desirable maternal and neonatal outcomes. To be effective and clinically meaningful interventions aimed at weight loss may have to occur early in pregnancy, or ideally, well before pregnancy or conception.

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