

Impact of obesity on rates of successful vaginal delivery after term induction of labor

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Keywords: Morbid obesity, induction of labor, vaginal delivery, neonatal outcome

Abstract

Objective: Determine success of term inductions of labor among an obese patient population.

Methods: A retrospective chart review of all women greater than 37 weeks gestation who underwent induction of labor at University of Iowa Hospital and Clinics (12-2012 to 03-2013). Chart abstraction included data from the patient's prenatal care, medical history, labor history, delivery and postpartum course. Subjects were stratified by pre-pregnancy BMI.

Results: 74 inductions occurred at greater than 37 weeks gestation during the study period. Successful vaginal delivery (operative and spontaneous) occurred for 80.4% of normal weight women versus 82.6% for women who were obese pre-pregnancy ($p=0.85$). Induction of obese women was associated with significantly longer infant admission (2.82 days vs 6.09 days, $p=0.03$) and a higher likelihood to be admitted to neonatal intensive care (5.88% vs 26.09%, $p=.021$).

Conclusions: While rates of successful vaginal delivery following induction were similar between normal weight and obese women, infants of

obese women were more likely to require admission to neonatal intensive care and require longer hospital stays.

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Introduction

Obesity is a growing epidemic facing healthcare in the United States. More than one-third of all adults are obese (Body Mass Index or BMI ≥ 30), with 6% of the population classified as extremely obese (BMI ≥ 40).¹ For one-third of women of childbearing age, obesity will complicate pregnancy. Obese women face higher rates of gestational diabetes mellitus and therefore macrosomic babies, an increased risk of preeclampsia and hypertension, as well as higher rates of post-term pregnancy.²⁻⁴ For these reasons, obese

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pregnant women are more likely to have a medical indication for delivery prior to spontaneous labor.⁵ Thus, obese women are more likely to undergo induction of labor. However, induction of labor is not without risks and added complications in any parturient, but particularly in obese women. Inductions in obese patients are known to require higher oxytocin requirements, longer labor length, as well as significantly higher cesarean delivery rates.⁶ Obese women are more likely to experience slower progress during labor and delivery and maternal and fetal distress, at times necessitating an emergency caesarean section. It has been reported that women with class III obesity (BMI \geq 40) have a failed induction rate of 29%.⁷ However, the specific rate and impact of failed inductions across the obese population remains unclear posing difficulties to clinicians on how best to counsel their obese patients of term gestation.

The purpose of this study is to determine the rate of failed induction among obese patients as stratified by their pre-pregnancy BMI. Although cesarean delivery may offer a more predictable alternative to induction of labor for the obese parturient, it comes with a significant risk of maternal morbidity and mortality.⁸⁻¹⁰ Information about the success of induction of labor would offer providers improved ability to counsel obese women about their options for delivery.

Methods

This study was a retrospective chart review of all inductions of labor for women greater than 37 weeks gestation occurring at University of Iowa Hospital and Clinics between December 2012

and March 2013 based on procedural billing codes. IRB approval was acquired for all study activities. The medical charts of qualified patients were reviewed for demographics, past medical history, prenatal care complications, labor, delivery, and postpartum course. Neonates were also investigated for nursery of admission and days spent in neonatal intensive care unit, if any. Study data were collected and managed using REDCap electronic data capture tools hosted by the University of Iowa.¹¹ REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies.

The primary outcome was defined as successful vaginal delivery; spontaneous or operative (assisted forceps or vacuum). Secondary outcomes included the length of induction, rate of chorioamnionitis, and re-admission within first six weeks postpartum. Obesity was defined as a BMI \geq 30 pre-pregnancy. Statistical analysis used SAS statistical software. Demographic data was compared using the Student's t-test and the Chi-square test. Outcome data was analyzed using univariate analysis to assess impact of BMI on successful vaginal delivery after induction.

Results

102 inductions occurred during the study period with 74 patients undergoing induction at greater than 37 weeks gestation. 31.8% were obese (BMI > 30), including 12 women who fit criteria for morbid obesity class III (BMI > 40). Age, race, number of prior vaginal deliveries and rate of neuroaxial analgesia were not significantly different

between the non-obese and obese populations. Obese women were significantly more likely to use tobacco

in pregnancy (1.96% vs 17.39%, $p=0.03$) and to be African American or Hispanic (Table 1).

Table 1. Demographic data

Demographic	Non-Obese Pre-pregnancy BMI <30	Obese Pre-pregnancy BMI ≥30	P-value
Age (years)	28.70	30.43	0.22
Prior vaginal deliveries (operative and spontaneous)	0.76	1.09	0.29
Cervical dilation at start of induction	1.90	1.98	0.82
Neuroaxial analgesia during labor	68.6%	65.2%	0.773
Tobacco use	1.96%	17.39%	0.03

The total rate of successful induction of labor resulting in a vaginal delivery (spontaneous and operative) was 81.1 % for the entire cohort. For those who were normal weight pre-pregnancy, the success was 80.39% versus 82.61% for women who were obese pre-pregnancy ($p=0.85$), which was not significantly

different. Interestingly, in this cohort, all 12 women with class III obesity (BMI >40) delivered via spontaneous vaginal delivery. There was no significant difference when the population of women with BMI greater than 30 were divided into those with BMI between 30-40 and those with BMI >40 (Table 2).

Table 2. Primary outcomes

Mode of delivery	Non-Obese Pre-pregnancy BMI <30	Obese Pre-pregnancy BMI ≥30		P-value
Vaginal delivery (spontaneous and operative)	80.39%	82.61%		0.85
	BMI <30	BMI 30-40	BMI>40	
Vaginal delivery (spontaneous and operative)	80.39%	63.64%	100%	0.41 (BMI <30 : 30-40) 0.20 (BMI 30-40 : >40) 0.08 (BMI <30 : >40)

Review of secondary outcomes (Table 3) showed that induction of obese women was associated with a significantly longer infant admission (2.82 days vs 6.09 days, $p=0.03$). Although not significant, infants of obese women were 5.75 times more likely to

be admitted to the neonatal intensive care unit than the infants of non-obese women ($p=0.059$). In addition, obese patients required more doses of misoprostol 25 mcg (3.11 vs. 1.96; $p=0.03$) and dinoprostone 10mg (1.43 vs. 1.06; $p=0.03$) for induction. There

was no significant difference in infant weights, rate of chorioamnionitis or re-

admission in the postpartum period.

Table 3. Secondary outcomes

Outcome	Non-Obese Pre-pregnancy BMI <30	Obese Pre-pregnancy BMI ≥30	P-value
Infant admission to the NICU	5.88%	26.09%	0.02
Infant weight (grams)	3951.7	3436.1	0.58
Length of infant admission (days)	2.82	6.09	0.03
Pediatrics present at delivery	60.8%	69.6%	0.46
Chorioamnionitis	17.7%	14.0%	0.74
Doses of misoprostol 25mcg	1.96	3.11	0.03
Doses of dinoprostone 10mg	1.06	1.43	0.03
Meconium present	17.65	30.43	0.23
Estimated blood loss (mL)	528.0	503.4	0.78
Length of ruptured membranes (min)	376.4	417.3	0.64

Discussion

We hypothesized that obese patients would have a higher rate of inductions resulting in cesarean delivery due to increased risk of complications within this population. Our study did not show any significant statistical difference in failure of inductions between the obese and non-obese population. These early results may suggest that induction at term for obese patients is a reasonable course of action rather than primary caesarian section if delivery is indicated before the start of spontaneous labor. Of note, obese women were more likely to require more doses of induction agents. The lack of a statistical difference could be attributed to the small size of this initial study. Also of note, the twelve patients included in this study with class III obesity (BMI greater than 40) all delivered via spontaneous vaginal delivery contradicting previously reported decreased successful vaginal delivery rates after induction in this

patient population.⁷ Again, this may also be due to our small sample size.

Our study did find a correlation between obese pregnant women and increased lengths of infant hospital stay and NICU admissions, despite similar rates of medical and pregnancy related comorbidities. The infants of obese mothers in this study required on average six days in the hospital. This is more than double the average length of hospital stay for their counterparts of non-obese mothers. Although this negative impact of maternal obesity for neonates at birth is concerning, further investigation into the long term impact of maternal obesity on infants is needed. Along with the health impacts of maternal obesity on the baby, this also implies a dramatically greater hospital fee and larger healthcare allocation dedicated to these infants.

Our preliminary efforts indicate induction as a reasonable course of action for

obese patients, particularly with the known increased risks of cesarean delivery in this population (infection, wound dehiscence, venous thromboembolism, among others).^{8,10} However, the infants of obese patients typically require longer hospital and have higher rates NICU admission.

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