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What is the Relationship Between Maternal BMI > 30 and Method of Delivery?

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By

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ABSTRACT

Maternal obesity and its correlation to method of delivery are important when determining risk factors and examining adverse events and complications during pregnancy and labor. This study was completed as a retrospective review of the Uniform Data Set (UDS) of midwifery deliveries. It examined maternal body mass indexes (BMIs) pre-pregnancy as well as the impact these BMIs had on the method of delivery. Results of this study determined that there was a relationship between maternal BMI > 30 and the method of delivery. Women with a maternal BMI > 30 are 1.93% more likely to have a Cesarean delivery rather than a vaginal birth.

What is the Relationship Between Maternal Body Mass Index (BMI) > 30 and Method of Delivery?

INTRODUCTION

Maternal obesity and its impact on the relationship to the route of delivery is a topic of growing concern in the United States. This is largely due to the rising rates of both obesity and Cesarean deliveries. Obesity is an emerging global health problem that is impacting pregnancy, labor, and child birth outcomes. It has been estimated that 54% of women between the ages of 20-40 are overweight or obese in the United States (2) with 22% being classified as obese (1). Due to the large rise in numbers of obese mothers, researchers and physicians have now begun to classify maternal obesity based on specific criteria. Any woman with a body mass index (BMI) ranging from 30-39.9 is classified as obese (9). Women meeting the criteria of having a body mass index (BMI) ranging from 40-49.9 are classified as morbidly obese (9). Women with a body mass index (BMI) > 50 are classified as super obese (9). Maternal obesity has been significantly associated with an increased risk of Cesarean delivery and a decreased frequency of vaginal delivery (9).

Increased rate of Cesarean sections is another prominent area of interest. This trend encompasses a large variety of birthing women of all different races, ages, and geographic locations. The rate of Cesarean births has steadily increased within the last couple of decades. In 1996, there was a 21% rate of Cesarean births, whereas, in 2007, the rate increased to 32%, indicating there has been a 53% increase in Cesarean deliveries in the United States over time (4). Maternal obesity has been significantly associated with an increased risk of Cesarean delivery (9) in part to the increased risk of obstetrical complications that tend to arise after the

induction of labor in obese women such as prolonged labor, non-reassuring fetal heart rate rhythms, and uterine rupture (9). Although these complications may arise in women of all weights, obese women tend to have dramatically increased rates of complications during labor induction (9).

Maternal obesity has been linked to pregnancy and labor complications that influence the method of delivery including gestational hypertension, diabetes mellitus, preeclampsia, stillbirth, postpartum infection, and abnormal birth defects (3). Other complications seen in obese mothers postpartum include increased risk of venous thromboembolism, higher rates of anesthetic complications, and an increased risk of wound infection (7).

Obesity is a predisposing indicator of Cesarean delivery (9). In a collaborative study conducted by physicians sponsored by the American College of Obstetricians and Gynecologists, it was indicated in their analysis that 1 in 7 Cesarean deliveries are attributable to overweight women and obesity (5). In a Swedish study, overweight and obese women accounted for approximately 45% of all Cesarean sections following labor induction. Elevated maternal BMI was found to be the second strongest risk factor for Cesarean births following labor induction in post-term women (6). Rates of vaginal delivery are low in obese groups, due to the reluctance of physicians to perform them in obese mothers as a result of increased risk of shoulder dystocia (7). Lastly, a study by Heather E. Robinson, MD, Colleen J. O'Connell, PhD, K.S. Joseph, MD, PhD, and N. Lynne McLeod, MD, noted maternal obesity places a greater risk of morbidity in women who undergo Cesareans, as well as increased rates of complications in Cesarean settings (8). These studies indicate a positive correlation between maternal morbidity and Cesarean mode of delivery. Obese mothers are strongly advised by physicians to have Cesarean deliveries in hopes of the fetus undergoing a less stressful and non-traumatic birth. However, these

mothers are placed at a higher risk for complications during labor and delivery when undergoing a Cesarean section.

The Uniform Data Set (UDS) was developed by the American Association of Birth Centers and used in the National Birth Center Study. It consists of 189 variables describing demographic characteristics, risk factors, care processes, and maternal-infant outcomes for women delivered in a birth center. Currently the database contains more than 40,000 records (10). Women that decide to have a natural delivery in a birthing center must be deemed as relatively low-risk pregnancies in order to proceed with giving childbirth in a birthing center. Therefore, the women that are able to give birth in birthing centers are generally healthy women that have uncomplicated vaginal deliveries. The only complication examined in this research was women having a maternal BMI > 30.

SPECIFIC AIMS

The purpose of this study was to examine the relationship between maternal obesity and method of delivery from a population of women included in the National Birth Center Study (10). More specifically, the goal was to investigate whether or not maternal obesity presents as a higher risk for Cesarean delivery.

METHODOLOGY

This study was conducted as a retrospective review of the Uniform Data Set (UDS) midwifery dataset. This dataset is comprised of approximately 15,000 documented birthing experiences of mothers and includes variables examining labor and infant outcomes from the years 2007-2010. From this data base, the number of Cesarean sections in women with a body mass index (BMI) of < 30 and >30 was analyzed. Body mass index (BMI) values were

calculated using the women's height (in inches) and weight (in kilograms) to determine their body mass index (BMI) pre-pregnancy. Descriptive statistics were used to describe the sample. Chi square test and simple logistic regression were performed to examine the degree of association between maternal obesity and method of delivery. The statistical analysis was carried out using SAS statistical program software. To ensure confidentiality and privacy of the participants of the previous study, no form of identification was recorded. Study participants were assigned a random case number as an identifier in order to match the mother's to route of delivery. This study was approved by the University of Arkansas Institutional Review Board.

RESULTS

Descriptive Statistics

A total of 15,574 women were included in this study of which 455 (2.9%) women had a BMI > 30 and 15,119 (97.08%) women had a BMI<30 (Table 1).

Table 1: Study Participants' BMI

BMI	Frequency	Percent	Cumulative Frequency	Cumulative Percent
BMI > 30	455	2.92%	455	2.92%
BMI < 30	15,119	97.08%	15,574	100.00%

Additionally, the majority of participants in the study were Caucasian married women between the ages of 18-35 years old (Table 2). However, women between 18-35 years of age with a BMI >30 constituted only 3% of the total number of women in that

age group. Approximately 85% of women with a BMI >30 were Caucasian and 25% were identified as non-Caucasians. African American women had the highest percentage of women with a BMI > 30 (5.15%) as compared to their BMI <30 counterparts.

Table 2: Study Participants' BMI, maternal age, marital status, and race

	BMI>30 (percent of total)	BMI< 30 (percent of total)	Total
Total Number Participants	455 (2.9%)	15,119 (97.08%)	15,574
Maternal age			
12-18ears old	2 (1.17%)	169 (98.83%)	171
18-35 years old	397(3%)	12,820 (97%)	13,217
>35 years old	54(2.8%)	2,040 (97.42%)	2,094
Marital Status			
Married	355 (2.93%)	11,754 (97.07%)	12,109
Unmarried	94 (3.12%)	2,921 (96.88%	3,015
Race			
Caucasian	382(2.87%)	12,944 (97.13%)	13,326
African American	48 (5.17%)	79 (94.79%)	840
Asian/Pacific Islander	5 (1.48%)	333 (98.52%)	338
Native American/Alaskan	4 (3.96%)	97 (96.04)	101
Unknown	8(1.2%)	432 (98.18%)	440

As noted in Table 3, of the 455 women with a BMI > 30 included in the birthing center study, 272 (60%) women were multiparous and 183 (40%) women were nulliparous. Of the women with a BMI < 30 (15,119), 7,938 (52.5%) women were multiparous and 7,181 (47.5%) women were nulliparous.

Table 3: Study Participants' Parity

	BMI>30 (percent of total)	BMI< 30 (percent of total)	Total
Total Number Participants	455 (2.9%)	15,119 (97.08%)	15,574
Nulliparous (1st baby)	183 (2.49%)	7,181 (97.51%)	7,364
Multiparous (> 1st baby)	272 (3.31%)	7,938 (96.69%)	8,210

Table 4 references the method of delivery for women with a maternal BMI > 30. 88% of these women had a normal spontaneous vaginal delivery with a cephalic presentation, 11.43% delivered by Cesarean section, and less than 1% required a vacuum-assisted vaginal delivery.

Table 4: Study Participants with a BMI > 30 Mode of Delivery

	Frequency	Percent	Cumulative Frequency	Cumulative Percent
NSVD/ Cephalic	402	88.35%	402	88.35%
Primary Cesarean	52	11.43%	454	99.78%
Vacuum-Assisted	1	0.22%	455	100.00%

As referenced by Table 5, 52 (11.43%) women of the 455 women with a BMI > 30 required a Cesarean delivery, versus 897 (5.93%) women of the women with a BMI < 30.

Table 5: Study Participants Cesarean vs. No Cesarean

	BMI>30 (percent of total)	BMI< 30 (percent of total)	Total
Total Number Participants	455 (2.9%)	15,119 (97.08%)	15,574
Cesarean Delivery	52 (11.43%)	897 (5.93%)	949
No Cesarean Delivery	403 (88.57%)	14,422 (95.34%)	14,825

Bivariate Analysis

In this section the relationship between maternal obesity defined as Body Mass Index (BMI) > 30 and method of delivery was examined. The contingency tables (Table 6 and 7) below show a higher prevalence of Cesarean section in obese mothers (11%) than in non-obese mothers (6%). A chi-square test was used to study the statistical association between maternal obesity and method of delivery. The level of statistical significance was set at an alpha=0.05. Results yielded a chi-square of 23.31. At an α, the critical value of chi-square with one degree of freedom is 3.84. This indicates that there is a statistically significant association between the weight status of the mother (BMI >30 vs. BMI <30) and the method of delivery,

Table 6: Association between Maternal Obesity and Method of Delivery (frequencies)

Method of delivery	BMI > 30 (obese mothers)	BMI <30 (non-obese mothers)	Total
Cesarean section	52	897	949
No Cesarean section	403	14,222	14,625
Total	455	15,119	15,574

Table 7: Association between Maternal Obesity and Method of Delivery (percent)

Method of delivery	BMI > 30 (obese mothers)	BMI <30 (non-obese mothers)
Cesarean section	11%	6%
No Cesarean section	89%	94%
Total	100%	100%

Logistic Regression

Our results from the bivariate analysis provided a strong evidence of an association between maternal obesity and method of delivery. Based on these findings, a simple logistic regression was performed to examine whether or not maternal obesity affects the probability of having a Cesarean section. Results indicated that –*all things being equal*-- obese mothers had a significantly higher odds of requiring a Cesarean section as compared to their normal weight peers (Unadjusted OR=2.05, Confidence Interval 1.52-2.75).

DISCUSSION

This study indicated that women were almost two times as likely to have a Cesarean delivery if their BMIs were greater than 30 as compared to women with BMIs less than 30.

There were several other findings based on the classification of mothers and the percentage with a BMI > 30. Within each racial group, obesity is more prevalent in African American mothers than it is in any other racial subpopulation. Native American/Alaskan and Asian/Pacific Islander constituted only 3.5% of obese women, and there were no Hispanic women in this study. Therefore, there could be differences between these ethnic groups that were not captured in this study.

CONCLUSION

Based on the findings of the research presented above, there is a need for more research on the relationship between maternal BMI > 30 and method of delivery. Considering that obesity was more prevalent among African American women as compared to the other racial groups, there is a need for future research to examine whether or not African American obese mothers are at increased risk of having a Cesarean section as compared to other races. Additionally, future research efforts should be made to include other diverse populations including American Indian/Alaskan, Asian/Pacific Islander, and Hispanic women. Other issues to consider in future research efforts include the impact parity, age, and marital statuses have on maternal obesity.

There are some limitations to this study. The dataset in this secondary analysis is comprised of births that took place in birthing centers overseen by nurse midwives. Many women and couples that choose to see a nurse midwife throughout their pregnancy plan to anticipate having a natural child birth. Pharmacological intervention and medical management are not used during natural child birth.

That being said, the bivariate analysis indicated a statistical association between maternal obesity and method of delivery. Simple logistic regression suggested that maternal obesity is a risk factor for Cesarean section. However, considering that only an unadjusted odds-ratio was computed, the results do not support any conclusive evidence that maternal obesity has an influence on the likelihood of having a cesarean section. The potential influence of other covariates, such as race, age, parity, and marital status should be examined. Further research would need to take into account the influence of other risk factors when examining the relationship between maternal obesity and method of delivery.

The health statuses of women planning natural births at birthing centers are screened for appropriateness of midwifery managed deliveries. The women must be relatively healthy and low risk. Women with higher risk pregnancies including gestational diabetes, preeclampsia and maternal hypertension, placenta previa, multiple gestations, and malpresentation of the fetus are referred to obstetricians for delivery management.

SUMMARY

Many studies have been conducted and have analyzed the relationship between Cesarean deliveries and pregnancy and labor complications for both the mother and the child. Previous literature has identified maternal obesity risk factors and adverse events during pregnancy and labor as well as perinatal outcomes and child birth defects. The secondary data analysis conducted in this study identified importance of educating women considering pregnancy about the relationship between maternal BMI and method of delivery. Nurses must stress to women who are already overweight or obese and considering pregnancy that important lifestyle changes should be implemented before becoming pregnant.

References

1. Cogswell M, Perry GS, Schieve LA, et al: Obesity in women of childbearing age: Risks, prevention, and treatment. Prim care Update Ob/Gyns 8:17, 2001
2. Flegal K, Carroll MD, Ogden CL, et al: Prevalence and trends in obesity among US adults, 1999-2000. JAMA 288:5, 2002
3. American College of Obstetricians and Gynecologists. ACOG practice bulletin no. 105: bariatric surgery and pregnancy. Obstet Gynecol 2009; 113: 1405-13.
4. Menacker F, Hamilton BE. Recent trends in cesarean delivery in the United States. NCHS Data Brief No. 35. Hyattsville (MD): National Center for Health Statistics; 2010.
5. Hibbard, J.U., Gilbert, S., Landon, M.B., Hauth, J.C., Leveno, K.J., Spong, C.Y., … Gabbe, S.G. (2006). Trial of labor or repeat cesarean delivery in women with morbid obesity and previous cesarean delivery. *Obstetrics & Gynecology*, 108(1), 125-133.
6. Roos, N., Sahlin, L., Ekman-Ordeberg, G., Kieler, H., & Stephansson, O. (2010). Maternal risk factors for postterm pregnancy and cesarean delivery following labor induction. *Acta Obstetricia Et Gynecologica Scandinavica*, 89(8), 1003-1010.
7. Robinson, H.E., O'Connell, C.M., Joseph, K.S., & McLeod, N.L. (2005). Maternal outcomes in pregnancies complicated by obesity. Obstetrics and Gynecology, 106(6), 1357-1364.
8. Wolfe, K.B., Rossi, R.A., Warshak, C.R. (2011). The effect of maternal obesity on the rate of failed induction of labor. American Journal of Obstetrics and Gynecology, 205(2), 128.
9. Marshall, N. E., Guild, C., Cheng, Y. W., Caughey, A. B., & Halloran, D. R. (2012). Maternal superobesity and perinatal outcomes. American Journal of Obstetrics & Gynecology, 206(5), 417-6.
10. Rooks J, Weatherby N, Ernst E, Stapleton S, Rosen D, Rosenfield A. *Outcomes of care in birth centers: The National Birth Center Study.* N Eng 1 J Med. 1989: 321 (26): 1804-1811.