The Super Obese Parturient: Hemodynamic Risks And Cesarean Section Outcomes
A Retrospective Cohort Study

Sijay Abongwa DO, Teshi Kaushik MD, Ayesha Bryant MD, PhD, Michael Froelich MD, Andrew Hackney MD
Department of Anesthesiology and Perioperative medicine, University of Alabama at Birmingham

UAB The University of Alabama at Birmingham

Background

- Obesity is a growing public health concern, with increasing prevalence among pregnant individuals
  - In the united states, the estimated prevalence of overweight and obesity during pregnancy exceeds 55-63% .[1]
- Morbid obesity is defined as body mass index ≥ 40 kg/m² and Super obesity defined as body mass index ≥ 50 kg/m²
- Cesarean delivery performed under Neuraxial anesthesia in morbidly obese patients (BMI >40 kg/m²) has been associated with prolonged operative times, higher sensory block levels, and increased maternal hypotension. [2]

Methods

Primary objective: To determine the degree of hemodynamic instability in Super Obese parturients undergoing Cesarean

- We hypothesize that super obese parturients experience greater hemodynamic instability and require higher vasopressor doses, such as phenylephrine, to maintain blood pressure compared to their non-super obese counterparts.

Study design: Retrospective Cohort study

Population: Following institutional review board approval, medical records were reviewed for all patients who underwent cesarean delivery under neuraxial anesthesia between January 1, 2018, and December 31, 2023, at our institution. Parturients were stratified into six BMI categories

- Normal weight (18.5–24.9)
- Overweight (25–29.9)
- Obese Class I (30–34.9)
- Obese Class II (35–39.9)
- Obese Class III (≥40)
- Super-obese (≥50)

Exclusion Criteria: Parturients with cardiac diseases during pregnancy, those who failed neuraxial anesthesia and Parturients requiring hysterectomy.

The primary outcomes: Degree of hypotension in each group, measured by total phenylephrine usage (mcg/min), and hemodynamic instability within the first 30 minutes of neuraxial anesthesia onset, depicted by blood pressure variance. Covariates for primary outcomes were presence of comorbidities including Gestational diabetes, hypertensive, pre-eclampsia, and the type of neuraxial administered (Spinal, Combined spinal epidural and Epidural).

Secondary outcomes:

- Duration of neuraxial placement
- Time from surgery start to uterine incision
- Total surgical duration
- Estimated blood loss (EBL)
- APGAR scores

Statistical Analysis:

- Means and 95% confidence intervals for the outcomes by BMI categories and ANOVAs are used to examine bivariate differences.
- Multivariate log linear models are used to examine the association between the outcomes and BMI adjusting for covariates for the full cohort and separately by neuraxial types.

The Super Obese Parturient: Hemodynamic Risks And Cesarean Section Outcomes
A Retrospective Cohort Study

Sijay Abongwa DO, Teshi Kaushik MD, Ayesha Bryant MD, PhD, Michael Froelich MD, Andrew Hackney MD
Department of Anesthesiology and Perioperative medicine, University of Alabama at Birmingham

UAB The University of Alabama at Birmingham

Results

- A total of 1983 patient records were analyzed, and patients were categorized based on BMI as follows

Demographics by weight status

	Normal weight n=115	Overweight n=417	Obese I n=506	Obese II n=409	Obese III n=373	Superobese n=133	
	Mean/%	Mean/%	Mean/%	Mean/%	Mean/%	Mean/%	P-value
BMI	23.2	27.6	32.4	37.3	44.0	58.7	-
Maternal age	29.5	31.1	30.7	30.7	30.4	30.1	0.0983
Race							
White	43.5	42.0	36.8	30.8	27.6	27.1	<0.001
Black	33.0	27.8	32.8	43.3	49.3	57.9	
Other	10.4	16.5	12.8	10.3	11.5	10.5	
Hispanic	13.0	13.7	17.6	15.6	11.5	4.5	
Gestational age	37.6	38.0	38.0	38.0	37.9	37.4	0.0834
Parity	2.5	2.4	2.5	2.5	2.5	2.2	0.2822
Parity category							
0	1.7	2.2	3.2	1.0	1.6	3.8	0.387
1	22.6	16.5	16.6	19.8	18.8	21.1	
2	36.5	39.6	35.4	33.7	36.5	38.3	
3 or more	39.1	41.7	44.9	45.5	43.2	36.8	
gest diabetes	7.0	9.6	14.2	19.1	24.7	33.8	<0.001
hypertension	9.6	8.4	12.1	14.9	28.2	41.4	<0.001
preeclampsia	8.7	9.4	11.7	12.7	17.4	24.1	<0.001
Primary Technique							
Epidural	7.8	3.8	5.5	4.6	8.6	15.8	<0.001
CSE	30.4	31.4	32.0	41.6	45.8	69.9	
DPE	61.7	64.7	62.5	53.8	45.6	14.3	
ASA Status							
1	0.9	0.0	0.6	0.2	34.0	15.8	<0.001
2	67.0	71.5	69.2	55.5	65.7	79.7	
3	31.3	28.5	30.2	44.3	0.3	4.5	
4	0.9	0.0	0.0	0.0	0.0	0.0	
Type of procedure							
Primary not BTL	44.3	47.2	48.6	46.0	42.1	54.1	0.132
Primary BTL	2.6	4.3	7.1	7.1	5.9	6.0	
Repeat no BTL	36.5	35.5	30.6	32.0	32.4	26.3	
Repeat BTL	16.5	12.9	13.6	14.9	19.6	13.5	

Table 1: patient demographics

	Unadjusted				Adjusted			
	% change	p-value	95% CI		% change	p-value	95% CI	
phenylephrine use per minute (n=1963)	1.34	<0.0001	0.97	1.72	1.61	<0.0001	1.21	2.01
Variance in DBP (n=1897)	2.09	<0.0001	1.64	2.60	2.10	<0.0001	1.59	2.62
Variance in SBP (n=1897)	2.06	<0.0001	1.64	2.60	1.92	<0.0001	1.36	2.50
Variance in MAP (n=1896)	2.12	<0.0001	1.61	2.63	2.07	<0.0001	1.52	2.62

Adjusted controls for gestational diabetes, preeclampsia, and block type.

Table 2: Percent change in the outcome by a 1 unit increase in BMI, unadjusted and adjusted for covariates-Full sample

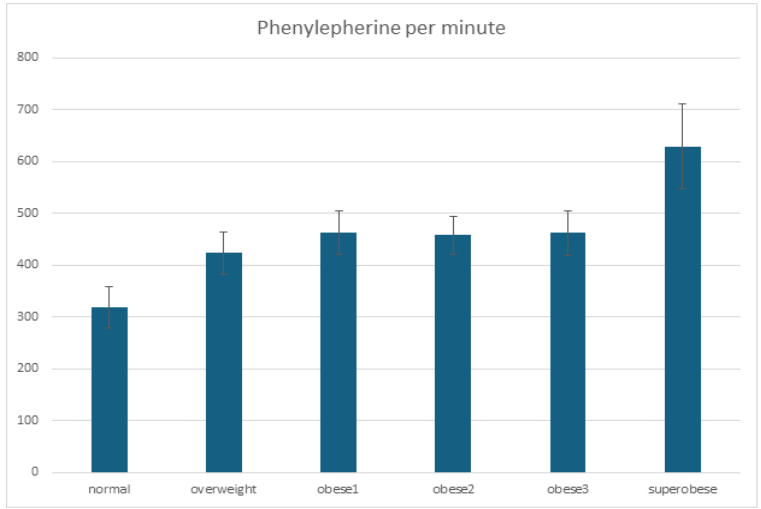


Figure 1: Hemodynamic Support Needs Across BMI Classes

A 1 unit increase in BMI is associated with a 1.61% increase in phenylephrine use after being adjusted for comorbidities like gestational diabetes and type of neuraxial anesthesia indicating more vasopressor requirements in patients with higher BMI

The Super Obese Parturient: Hemodynamic Risks And Cesarean Section Outcomes
A Retrospective Cohort Study

Sijay Abongwa DO, Teshi Kaushik MD, Ayesha Bryant MD, PhD, Michael Froelich MD, Andrew Hackney MD
Department of Anesthesiology and Perioperative medicine, University of Alabama at Birmingham

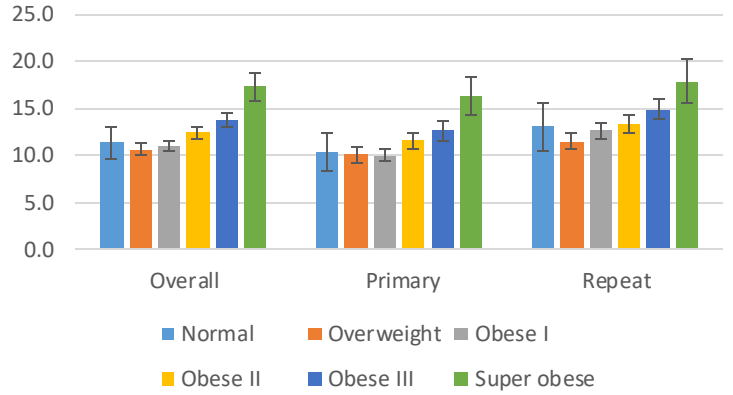
UAB The University of Alabama at Birmingham

Secondary outcomes/C-Section outcomes	Normal	Overweight	Obese I	Obese II	Obese III	Super obese
Procedure time to delivery	11.4	10.7	11.1	12.4	13.7 **	17.3 ***
primary	10.3	10.1	10.0	11.6	12.7 *	16.2 ***
repeat	13.1	11.5	12.6	13.3	15.0 +	17.9 ***
Time on anesthesia till procedure[1]	35.0	35.9	35.9	38.8 **	42.1 ***	50.6 ***
CSE	40.0	39.9	40.3	41.0	45.0 *	51.8 ***
Spinal	32.5	34.0	33.6	37.1 **	39.2 ***	44.6 ***
Total procedure time	57.4	56.2	57.0	60.1	64.5 **	77.6 ***
primary	51.4	50.3	51.6	56.5 +	60.3 **	77.3 ***
repeat[1]	60.3	55.7	62.9	61.4	55.8	68.3
primary with BLT	55.9	57.5	56.8	57.7	63.7 *	70.1 **
repeat with BLT[2]	73.0	60.9	64.5	63.7	71.3	82.1
Apgar 1 minute	7.5	7.5	7.5	7.4	7.2 +	6.9 **
Apgar 5 minute	8.7	8.6	8.6	8.5	8.6	8.5
EBL	712.2	741.7	762.2	790.7 **	811.3 ***	898.5 ***
primary	626.6	710.5 *	730.0 **	805.1 ***	793.5 ***	873.0 ***
repeat	783.3	761.3	751.0	765.4	814.1	857.7

Significance tests indicate significant differences between that weight status and normal weight
+ p<0.1, * p<0.05, ** p<0.01, *** p<0.001
[1] Excludes those who received an epidural
[2] Only 116 people are in the repeat C-section. Makes estimates by weight status more unstable
[3] Only 294 fit into repeat with BTL. Makes estimates by weight status more unstable.

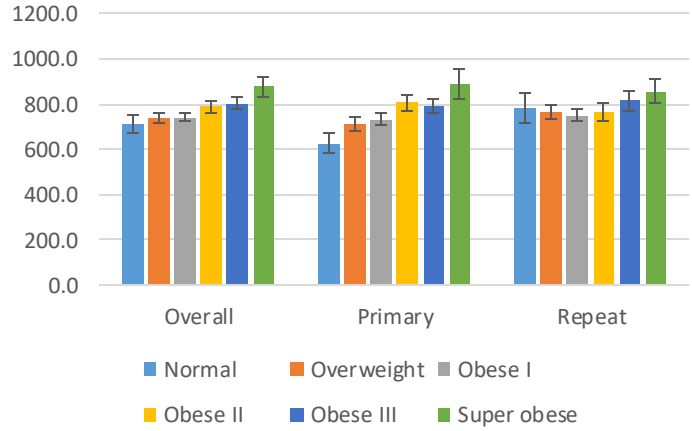
Table 3: Secondary outcomes

Figure 2: Procedure time to Delivery Across BMI Classes



Higher BMI was linked to prolonged uterine incision-to-delivery time and increased total surgical time, even after adjusting for the type of procedure

Figure 3: EBL Across BMI Classes



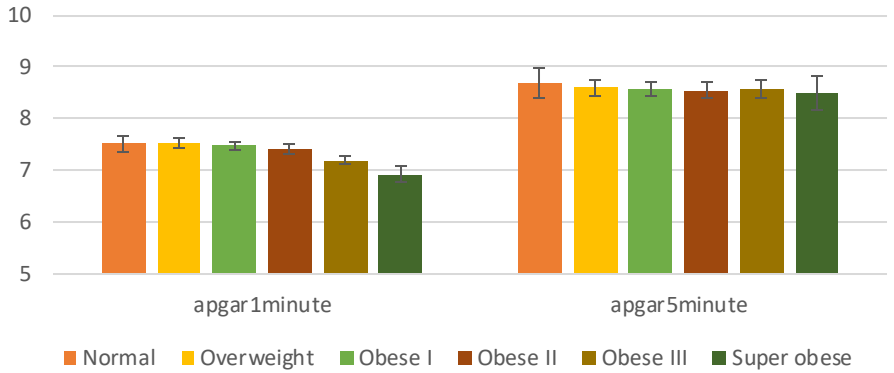
Estimated blood loss (EBL) progressively increased with rising BMI when adjusted for procedural type

The Super Obese Parturient: Hemodynamic Risks And Cesarean Section Outcomes
A Retrospective Cohort Study

Sijay Abongwa DO, Teshi Kaushik MD, Ayesha Bryant MD, PhD, Michael Froelich MD, Andrew Hackney MD
Department of Anesthesiology and Perioperative medicine, University of Alabama at Birmingham

UAB The University of Alabama at Birmingham

Figure 4: APGAR scores at 1 and 5 Minutes Across BMI Classes



1-minute APGAR scores were lower in patients with higher BMI, there was no significant difference in 5-minute APGAR scores across BMI groups

Discussion

- Our study demonstrates that BMI is a significant determinant of adverse Cesarean outcomes, with higher BMI classes experiencing increase vasopressor use, longer operative times, greater blood loss, and lower APGAR scores at 1 minute. Tailored anesthetic and surgical management strategies should be employed to mitigate risks in obese populations.
- Tailored anesthetic management for Super Obese parturient may include
  - Earlier crossmatching and increase vigilance for hemorrhage management
  - Early epidural placement and multidisciplinary planning
  - Modified vasopressor protocols for higher BMI classes
- Data on BMI ≥ 60 kg/m² is still limited, larger studies needed

Conclusion

- Understanding hemodynamic instability associated with obesity is critical for optimizing anesthetic strategies and reducing perioperative complications.

References

1. Almutairi FS, Alsaykhan AM, Almatrood AA. Obesity Prevalence and Its Impact on Maternal and Neonatal Outcomes in Pregnant Women: A Systematic Review. *Cureus*. 2024;16(12):e75262. Published 2024 Dec 7. doi:10.7759/cureus.75262
2. Marcio Luiz Benevides, Anne Karoline Coutinho Borges, Luiz Fernando et al. Body Mass Index and Clinical Outcomes During Cesarean Section Under Spinal Anesthesia. Int J Anesth Clin Med. 2022;10(2):44-51.