

The Risks of Cesarean Delivery in Obese Women

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Abstract

Objective: To estimate the risk and morbidity of cesarean delivery among obese women.

Setting: King Abdulaziz Medical City, Ministry of National Guard, Ob/Gyn Department, Riyadh, Saudi Arabia.

Design: A retrospective observational study.

Population: A cohort of (971) pregnant women were fulfilled the study criteria.

Methods: The data were collected from patients charts: Age, BMI, Parity, Anesthesia difficulty, Bleeding, admission to ICU, DVT, PE, Infection, GDM, Gestational hypertension, Bladder injury, Bowel injury, or Maternal death. Inclusion criteria: the pregnant women with age group of 18-45 years who underwent a cesarean delivery whether elective or emergency within one year. Exclusion criteria: BMI equal or less than 24.9, pregnancy with any chronic diseases (hypertension, diabetes mellitus, respiratory, cardiac, hepatic, or renal diseases), and repetitive cesarean section with adhesions, or with abnormal placentation.

Results: Of the (971) pregnant women with: overweight (25 - 29.9) 27.6%, Class 1 obesity (30 - 34.9) 27.6%, Class 2 obesity (35 - 39.9) 30.5%, and class 3 morbid obesity (≥ 40) 14.3%. Multivariate predictors of being in one of the higher BMI categories were older age, parity > 3 , anesthesia difficulty, infection, bleeding, hypertension, GDM (adjusted odds ratio (aOR) =1.7; 1.4; 10.9; 21.4; 2.8; 10.5; and 20, respectively).

Conclusion: Obese pregnant women carry a big burden on the responsibility of the medical staff, ante-natal monitoring for gestational diabetes, hypertension, and their fetal complications, and when cesarean delivery has been required a modified equipment, anesthesia /analgesia, bleeding, infection, surgical technique, and postpartum monitoring all are mandatory to ensure safety of such patients.

Keywords: Cesarean Delivery; Obesity

Introduction

Obesity has become one of the important public health problems in Saudi Arabia the prevalence of overweight (BMI = 25 - 29.9kg/m²) was 36.9%, in the female 31.8%, and obesity (BMI ≥ 30 kg/m²) was 35.5%, in the female 44%, while morbid obesity (BMI ≥ 40 kg/m²) 3.2% [1]. As the prevalence of obesity increases, the prevalence of the co-morbidities associated with obesity have been increased [2].

The risks of cesarean delivery increase with increasing severity of obesity [3]. Surgery in obese women is associated with numerous health hazards due to their tendency to have coronary artery disease, hypertension, hyperlipidemia, Type II diabetes mellitus, obesity hypoventilation syndrome, obstructive sleep apnea, gastro esophageal reflux, venous stasis disease, so the risk of deep vein thrombosis, pulmonary embolus, and superficial thrombophlebitis, will be increased. Hernias (umbilical, incisional), and Infection (cellulitis, panniculitis, postoperative wound infections) [4-6] as well.

Unfortunately obese women have a two-fold increase in the risk of emergency cesarean delivery [7-9]. There may be specific equipment needs to accommodate the obese patient (eg, larger and stronger operating tables, lifts, long instruments, large blood pressure cuffs, large pneumatic compression devices) [10-12]. Placement of peripheral intravenous lines may be difficult due to subcutaneous adiposity. Placement of neuraxial anesthesia can be difficult because the usual anatomic landmarks are obscured, the patient may be less able to flex her back, and the distance from skin to target is greater than normal, and epidurals are more likely to fail later, in which case general anesthesia may be needed for urgent cesarean delivery [13-15]. There is an increased risk of difficult mask ventilation and difficult or failed intubation.

The incision to delivery interval, and total operative time are increased, which might increase blood loss [16]. When pregnant women in the last half of pregnancy are placed in a supine position for cesarean delivery, standard procedure to prevent aortocaval compression, and supine hypotension from the combined effects of the panniculus, and the gravid uterus should be taken [17-18]. Appropriate patient positioning is also important to limit other physiological squeals, and reduce the risk of perioperative nerve, joint, soft tissue injury, and pressure necrosis [19]. Pharmacodynamics for drug therapy may be altered, because obese patients have a larger volume of distribution for lipophilic drugs, these changes predispose obese patients to both subtherapeutic and toxic responses to medications [20-22].

Postoperatively, obese women are at increased risk of wound infection and disruption 10 to 30 percent possible etiologies for wound problems include decreased oxygen tension, and immune impairment [23-24]. Moving and positioning the obese patient can be difficult and care must be taken to prevent falls and injury to the patient and staff. Special operating tables and hydraulic lifts may be needed to accommodate and move the patient.

The type of incision may affect exposure, ease of infant delivery, postoperative pain and respiration effort, wound strength, and complication rates. (Wound infection: vertical incision 35 to 46 percent; transverse incision 9 to 21 percent) [25-26]. The incision should be large enough to allow safe delivery of the fetus, and there is a higher prevalence of macrosomia, uterine exposure may be suboptimal, and the thick abdominal wall makes it harder to use the fingers to stretch the incision. Mass closure reduces the risk of dehiscence or hernia formation [27-28]. The subcutaneous layer should be closed well [29], reapproximation of the skin may be performed with staples or subcuticular suture no difference [30-32]. Obese patients require close postoperative cardiopulmonary monitoring, in addition to routine assessment of vital signs, and continuous pulse oximetry [33-34]. Multimodal analgesia using local anesthetics via the epidural route is the safest approach [35]. Opioids can be administered by a number of routes; Neuraxial opioids are preferred over parenteral opioids [36]. Early ambulation may also improve bowel function, as well as decrease the risk of venous thrombosis [37]. Obese pregnant women carry a big burden on the medical staff [38] because of their requirement of modified equipment, anesthesia and analgesia, surgical technique and postpartum monitoring to ensure safety.

Methods

A retrospective observational study of a cohort (971) pregnant women were fulfilled the study criteria. The data were collected from patients charts: Age, BMI, Parity, Anesthesia difficulty, Bleeding during the surgery, admission to ICU, DVT, PE, Infection, Gestational diabetes or hypertension, Bladder injury, Bowel injury, or Maternal death. Inclusion criteria: the pregnant women with age group of 18 - 45 years, and BMI more than 24.9, who underwent a cesarean delivery whether elective or emergency within one year from the first of January 2012 to December 2013. The BMI was classified to four groups: overweight (25 - 29.9), Class 1 obesity (30 - 34.9), Class 2 obesity (35 - 39.9), and class 3 morbid obesity (BMI \geq 40). Exclusion criteria: BMI equal or less than 24.9, pregnancy with any chronic diseases (hypertension, diabetes mellitus, respiratory, cardiac, hepatic, or renal diseases), or repetitive cesarean section with adhesions, or with abnormal placentation.

Statistical Analysis: IBM SPSS was used to perform the analyses. Sample characteristics summary was reported in Table 1. Subgroup analyses were used to compare prevalence rates of overweight, Class 1 obesity, Class 2 obesity, and Class 3 obesity across the sample characteristics (Table 2). Multivariate ordinal logistic regression model was applied to identify the factors that associated with the probability of being in one of the higher BMI categories (Table 3). P value \leq 0.05 indicative of statistical significance.

Results

Of the (971) pregnant women (Table1): 60% of them < 35 years of age and 40% more than 35 years, 60.7% of them they had more than 3 children, and 39.5% less than 3 , regarding BMI : Overweight (25 - 29.9) 27.6%, Class 1 obesity (30 - 34.9) 27.6%, Class 2 obesity (35 - 39.9) 30.5%, and class 3 or morbid obesity (≥ 40) 14.3%. 17.8% of the cases difficulty during anesthesia were found, 12.3% had bleeding during the surgery, 9 cases were complicated by bladder injury, and one case by bowel injury during the surgery, 10.2% of the cases had wound infection, 5 cases were admitted to ICU for monitoring post surgery, 5 cases, developed deep vein thrombosis (DVT), 2 cases pulmonary embolism (PE). Antenatal period 174 of them 17.9% developed gestational diabetes (GDM), and 59 of them 6.1% developed gestational hypertension, and no case of death.

Characteristics	Levels	n	%
Age	< 35 years	580	60.0
	≥ 35 years	387	40.0
BMI	25 - 29.9	267	27.6
	30 - 34.9	267	27.6
	35 - 39.9	295	30.5
	≥ 40	138	14.3
Parity	>3	589	60.7
	≤ 3	382	39.3
Anesthesia Difficulty	Yes	173	17.8
	No	798	82.2
Infection	Yes	99	10.2
	No	872	89.8
Bleeding	Yes	119	12.3
	No	852	87.7
ICU admission	Yes	5	0.5
	No	966	99.5
DVT	Yes	5	0.5
	No	966	99.5
PE	Yes	2	0.2
	No	969	99.8
Hypertension	Yes	59	6.1
	No	912	93.9
GDM	Yes	174	17.9
	No	797	82.1
Bowel Injury	Yes	1	0.1
	No	970	99.9
Bladder Injury	Yes	9	0.9
	No	962	99.1
Maternal Death	No	971	100.0

Table 1: The study patient's characteristics.

In relation to BMI to the patient’s characteristics (Table 2): Among the age group less than 35 years, 35.2% overweight (25 - 29.9), 26.9% class 1 obesity (30 - 34.9), 25.5% class 2 obesity (35 - 39.9), 12.5% class 3 obesity (≥ 40). Among the age group more than 35 years: 16.1%, 28.8%, 38.3%, and 16.8% respectively. In the group of 3 children or less 35.2% overweight (25 - 29.9), 26.0% class 1 (30 - 34.9), 27.9% class 2 (35 - 39.9), and 10.8% class 3 morbid obesity (≥ 40). In the group more than 3 children: 15.7%, 30.1%, 34.6%, and 19.6% respectively. Difficulties of anesthesia found in 4.6%, 2.3%, 46.2%, and 46.8% respectively. Bleeding during surgery was 13.6%, 5.9%, 55.9%, and 24.6% respectively. Infection occurred in 42.4% class 2 (35 - 39.9), 57.6% in class 3 (≥ 40) group. Admission to ICU was 3 cases among the group of class 2 (35 - 39.9), and 2 cases in the group of class3 (≥ 40). DVT cases were in the group of class 2 (35 - 39.9) and 2 in the group of class3 (≥ 40) only. PE one case for each of the class 2 (35 - 39.9), and class 3 (≥ 40) group only. In regard of bowel injury during surgery one case only among the group of class 2 (35 - 39.9) fortunately. Bladder injury 7 cases in the group of class 2 (35 - 39.9) and 2 cases in the group of class 3 (≥ 40) only. Ante natal we found 30 patients having gestational hypertension among group of (35 - 39.9), and 25 patients in the group of (≥ 40). Gestational diabetes was diagnosed in 2 patient of the group of class1 obesity (30 - 34.9), 86 patients in the group of class 2 (35 - 39.9), and other 86 patients in the group of class 3 (≥ 40).

Characteristics	Levels	25 - 29.9		30 - 34.9		35 - 39.9		≥ 40		P
		n	%	n	%	n	%	n	%	
Age	< 35 years	203	35.2	155	26.9	147	25.5	72	12.5	
	≥ 35 years	62	16.1	111	28.8	148	38.3	65	16.8	0.001*
Parity	≤ 3	207	35.4	152	26.0	163	27.9	63	10.8	
	> 3	60	15.7	115	30.1	132	34.6	75	19.6	0.001*
Anesthesia Diffi	Yes	8	4.6	4	2.3	80	46.2	81	46.8	0.001*
	No	259	32.6	263	33.1	215	27.1	57	7.2	
Infection	Yes	0	0.0	0	0.0	42	42.4	57	57.6	0.001*
	No	267	30.8	267	30.8	253	29.1	81	9.3	
Bleeding	Yes	16	13.6	7	5.9	66	55.9	29	24.6	0.001*
	No	251	29.6	260	30.6	229	27.0	109	12.8	
ICU admission	Yes	0	0.0	0	0.0	3	60.0	2	40.0	0.018*
	No	267	27.8	267	27.8	292	30.4	136	14.1	
DVT	Yes	0	0.0	0	0.0	3	60.0	2	40.0	0.018*
	No	267	27.8	267	27.8	292	30.4	136	14.1	
PE	Yes	0	0.0	0	0.0	1	50.0	1	50.0	0.102
	No	267	27.7	267	27.7	294	30.5	137	14.2	
Hypertension	Yes	4	6.8	0	0.0	30	50.8	25	42.4	0.001*
	No	263	29.0	267	29.4	265	29.2	113	12.4	
GDM	Yes	0	0.0	2	1.1	86	49.4	86	49.4	0.001*
	No	267	33.7	265	33.4	209	26.4	52	6.6	
Bowel Injury	Yes	0	0.0	0	0.0	1	100.0	0	0.0	0.504
	No	267	27.6	267	27.6	294	30.4	138	14.3	
Bladder Injury	Yes	0	0.0	0	0.0	7	77.8	2	22.2	0.008*
	No	267	27.9	267	27.9	288	30.1	136	14.2	

Table 2: BMI and its relation to the study patient’s characteristics.

*Significant at $\alpha = 0.05$.

Multivariate ordinal logistic regression results are shown in (Table 3): The probability risk of being in one of the obese categories was more in women with anesthesia difficulty (adjusted odds ratio (OR) = 10.9), infection (aOR = 21.4), bleeding (aOR = 21.4), hypertension (aOR = 10.5), and GDM (aOR = 20). The probability risk of being in one of the obese categories was less in women aged < 35 years (aOR = 0.6), parity ≤3 (aOR = 0.7).

Parameter	B	SE	95% Wald Confidence Interval		Hypothesis Test		OR	95% Wald Confidence Interval for Exp(B)	
			Lower	Upper	Wald Chi-Square	Sig.		Lower	Upper
Threshold [BMI: 1]	-0.90	0.13	-1.152	-0.644	48.099	0.001*	0.4	0.316	0.525
[BMI: 2]	0.89	0.13	0.637	1.149	46.771	0.001*	2.4	1.891	3.155
[BMI: 3]	4.55	0.26	4.044	5.057	310.167	0.001*	94.7	57.050	157.074
Age < 35 years	-0.43	0.15	-0.727	-0.136	8.207	0.004*	0.6	0.483	0.873
Parity ≤ 3	-0.41	0.15	-0.705	-0.113	7.325	0.007*	0.7	0.494	0.893
Anesthesia Difficulty	2.39	0.22	1.956	2.825	116.350	0.001*	10.9	7.071	16.855
Infection	3.06	0.29	2.492	3.633	110.728	0.001*	21.4	12.087	37.827
Bleeding	1.03	0.22	0.597	1.466	21.655	0.001*	2.8	1.817	4.332
ICU admission	0.96	1.16	-1.315	3.229	0.682	0.409	2.6	0.268	25.260
DVT	-1.24	1.36	-3.911	1.425	0.834	0.361	0.3	0.020	4.157
PE	5.84	1.96	2.001	9.682	8.886	0.003*	344.2	7.394	16025.143
Hypertension	2.35	0.33	1.703	2.991	51.011	0.001*	10.5	5.489	19.903
GDM	3.00	0.24	2.531	3.461	159.354	0.001*	20.0	12.561	31.845
Bowel Injury	-4.92	2.22	-9.274	-0.571	4.915	0.027	0.01	0.001	0.565
Bladder Injury	1.27	0.76	-0.226	2.766	2.768	0.096	3.6	0.798	15.891

Table 3: Multivariate risk factors of BMI.

*Significant at $\alpha = 0.05$.

Discussion

As the prevalence of obesity increases, the prevalence of the complications associated with obesity during pregnancy, to have cesarean delivery, and for post-delivery period care; for each of these conditions the risk has been increased.

In our study (971) pregnant women were found fulfill the criteria ; 60% of them < 35 years of age and 40% more than 35 years, so obesity was more common among younger age , 60.7% of them they had more than 3 children, and 39.5% less than 3 , and in regard of BMI : Overweight (25 - 29.9) 27.6%, Class 1 obesity (30 - 34.9) 27.6%, Class 2 obesity (35 - 39.9) 30.5%, and class 3 morbid obesity (≥ 40) 14.3%, the highest prevalence was of class 2 obesity 30.5%. Antenatal period 174 patients; 17.9% developed gestational diabetes (GDM), and 59 patients; 6.1% developed gestational hypertension. 17.8% had been reported with difficulty during anesthesia because of the usual anatomic landmarks are obscured, and less able to flex the back, and the distance from skin to target is greater than normal, and epidurals cases were more likely to fail, in which case general anesthesia needed for cesarean delivery, and the increase risk of difficult mask ventilation and difficult or failed intubations were found.12.3% had bleeding during the surgery due to increase the interval time between the incision and delivery time, 9 cases were complicated by bladder injury, and one case of bowel injury during surgery, 10.2% of the cases came back with wound infection.

5 cases were developed Deep vein thrombosis DVT, and 2 cases pulmonary embolism PE, 5 cases were admitted to ICU for monitoring, fortunately no cases ended by maternal death.

Among the age group less than 35 years, obesity class 2 BMI (35 - 39.9) were 25.5%, vs 38.3% in the age group of more than 35 years, in class 3 morbid obesity BMI (≥ 40) 12.5%, vs 16.8% in more than 35 years of age; with p value 0.001. In the group of 3 children or less 27.9% of class 2 BMI (35 - 39.9) vs 34.6% in the group of more than 3 children. Whereas class 3 morbid obesity BMI (≥ 40) was more among women of more than 35 years of age; 19.6% vs 10.8%; with p value 0.001. Difficulties of anesthesia found in 46.2% in class 2 vs 46.8% in class 3 morbid obesity; with p value 0.001, 4 cases 2.3% in class 1 obesity BMI (30 - 34.9), and 8 cases 4.6% in overweight BMI (25 - 29.9). Bleeding during surgery was more in class 2; 55.9% vs 24.6% in class 3 morbid obesity; with p value 0.001. Infection occurred in 42.4% class 2, and more in class 3 group 57.6%; with p value 0.001. Admission to intensive care unit (ICU) 3 cases among the group of class 2 BMI (35-39.9), and 2 cases in the group of class 3 morbid obesity BMI (≥ 40); with p value 0.018. Deep vein thrombosis DVT 3 cases were in the group of class 2 BMI (35 - 39.9) and 2 in the group of class 3 BMI (≥ 40); with p value 0.018. Pulmonary embolism PE one case for each of the class 2 and class 3 group. In regard of bowel injury during surgery one case only among the group of class 2 obesity BMI (35 - 39.9) fortunately. Bladder injury 7 cases in the group of class 2 BMI (35 - 39.9); with p value 0.008, and 2 cases in the group of class 3 BMI (≥ 40) only. Ante natal 30 patients having gestational hypertension 50.8% among group of class 2 BMI (35-39.9), and 25 patients 42.4% in the group of class 3 BMI (≥ 40); with p value 0.001. Gestational diabetes GDM was diagnosed in 86 patients 49.4% of class 2 obesity BMI (35 - 39.9); p value 0.001, and the same 86 patients 49.4% in the group of class 3 morbid obesity BMI (≥ 40), fortunately with macrosomic fetuses but no fetal trauma occurred.

The probability risk of being in one of the obese categories was more in women class 3 morbid obesity adjusted odds ratio (aOR = 94.7), class 2 obesity odds ratio (aOR = 2.7), Anesthesia difficulty (adjusted odds ratio (aOR = 10.9), infection (aOR = 21.4), bleeding (aOR = 21.4), hypertension (aOR = 10.5), and GDM (aOR = 20). The probability risk of being in one of the obese categories was less in women aged < 35 years (aOR = 0.6), parity ≤ 3 (aOR = 0.7).

Conclusion

Obese pregnant women carry a big burden on the responsibility of the medical staff, ante-natal monitoring for gestational diabetes, hypertension, and their fetal complications, and when cesarean delivery has been required a modified equipment, anesthesia/analgesia, bleeding, infection, surgical technique, and postpartum monitoring all are mandatory to ensure safety of such patients.

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