

Pregnancy Outcomes Following Bariatric Surgery

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ABSTRACT

Obesity in Saudi Arabia is three times the global average. Bariatric surgery as a fast solution to obesity problems associated with higher rate of Diabetes mellitus remission. In gestational diabetes mellitus, bariatric surgery in small scale studies showed promising outcomes for both the mother and the infant. This study investigated gestational diabetes mellitus and perinatal outcomes in women with history of bariatric surgery compared to matched women without such a history. In this retrospective multicenter cohort study in Al-Baha area, 2412 women were included. This study concluded that bariatric surgery may be associated with reduced risks of gestational diabetes, macrosomia, operative deliveries, congenital malformation and neonatal mortality. Also, this study showed the need for nationwide studies on such important issue.

Key words: Bariatric Surgery, Gestational Diabetes Mellitus, Retrospective study, multicenter study, Macrosomia, Matched control group.

INTRODUCTION

Obesity is a growing complex problem globally [1]. Saudi Arabia (SA) notably has an obesity prevalence three times higher than the global average [2]. This lead to almost double the global death rate in Saudi Arabia [3]. World health organization (WHO) showed that in SA overweight is 68.2% while obesity is estimated to be 33.7% [3, 4].

Obesity affects fertility by affecting hormones level [5]. Later if pregnancy occur, majority of women in early pregnancy are either overweight or obese (BMI, ≥ 25) [6]. Maternal obesity is a risk factor for gestational diabetes, macrosomia, difficult complicated delivery, offspring obesity and later on diabetes in both mother and offspring. Maternal obesity increases risk of stillbirth, preterm birth and congenital anomalies [5, 6].

The first weight loss operation or bariatric surgery was conducted in 1954 in Carolina, USA. Later this operation was altered in 1963 and innovation kept going until the recent variety of

bariatric surgeries available now [7]. bariatric surgery resulted in higher rates of diabetes remission with fast therapy for obesity [8]. Regarding gestational diabetes many small studies show excellent decrease in rates but most of these studies did not consider presurgery BMI [9, 10]. The same was found regarding neonatal complications with majority did not look at presurgery BMI [11].

This study investigated the risks of gestational diabetes and adverse perinatal outcomes among women with a history of bariatric surgery as compared with women without such a history but with similar characteristics.

METHODOLOGY

This is a retrospective multicenter cohort study conducted in Al-Baha area, Saudi Arabia. Patient files from six hospitals were reviewed between fifth of January 2022 and end of June 2022. This study included all women who delivered in any of the government hospitals in Al-Baha area between first of January 2016 and 31st of December 2021.

Al-Baha area is located in the southwestern part of SA. It has an area of 9,921 km², and a population of 550,958 (2021) [12]. There are six major cities in the area with six government hospitals (King Fahad Hospital in Al-Baha city, Prince Meshary bin Saud general Hospital in Baljorashi, Al-Aqiq Hospital in Al-Aqiq, Almandaq General Hospital in Al-Mandaq, Al Makhwah General Hospital in Al Makhwah and Qelwah General Hospital in Qelwah).

Patients who had bariatric surgery were considered in the intervention group. Weight and height measurements at the time of surgery were used to calculate presurgery BMI. Measured weight and height at first antenatal visit used to calculate early- pregnancy BMI. Smoking and education data collected. 75 mg Glucose Tolerance Test data collected.

Intervention patients were matched with control patients in the ratio of 1:3. They were matched for age, parity, presurgery BMI, education and delivery year. Primary outcomes were Gestational Diabetes mellitus (GDM) and Macrosomia. Secondary outcomes included Operative deliveries, preterm birth, congenital malformations, intrauterine fetal death (IUFD) and neonatal mortality.

In this study, any women diagnosed with chronic Diabetes before pregnancy were excluded. On top of that any woman with missing matching data or with multiple pregnancy were excluded. The number of gestational week was determined by ultrasonography (US). Gestational diabetes is diagnosed based upon 75 mg Glucose Tolerance Test with fasting blood sugar (FBS) 5.1 mmol/l (92 mg/dl), 1 hour post glucose drink 10 mmol/l (180 mg/dl) and 2 hours 8.5 mmol/l (150 mg/dl). Macrosomia defined as birth weight above the 90th percentile. Operative deliveries include any delivery conducted by lower segment cesarean section (LSCS), ventous or by forceps. Preterm birth defined as any delivery before 37 completed week and after 24 completed week of pregnancy. Neonatal mortality defined as number of newborns dying between time of birth and less than 28 days of age divided by number of live births.

Analyzed data are represented either as simple statistics (number, percentage or mean $\pm$ standard deviation). Statistical analysis involved two sample test and chi-square test as appropriate. P value of 0.05 or less considered significant. This study was approved by Al-Baha

University Faculty of Medicine Ethical committee and Al-Baha Province Ministry of health Ethical committee. Privacy of patients personal data kept and files were reviewed only in the filing area of each hospital, and all participants information was kept anonymous.

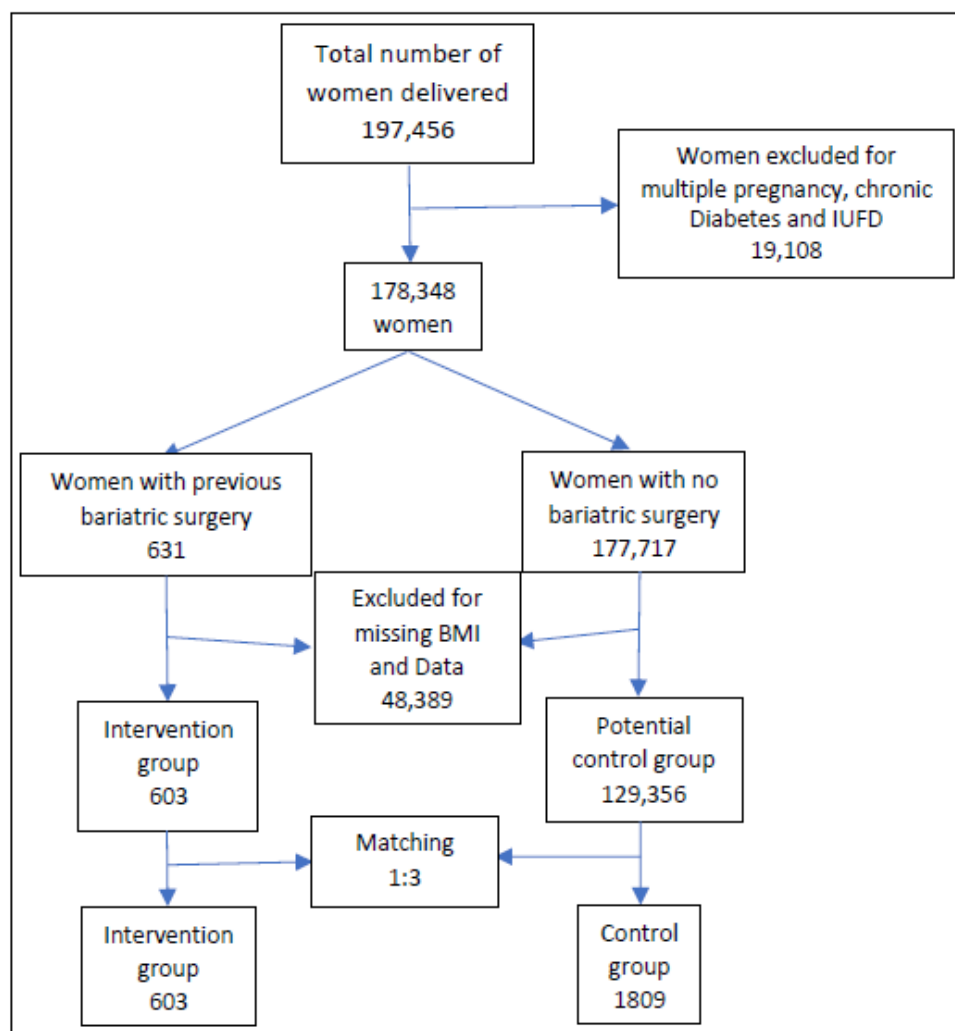


Figure 1: Participants flow chart

RESULTS

Total number of women delivered in al-Baha area was 197,456. After applying exclusion criteria only 603 women were included in the intervention group and 129,356 women were in the potential control group. After applying matching for women the control group included 1809 women. This matching was exactly 1:3 intervention: control women.

Almost, 92% (555) of the bariatric-surgery procedures were gastric bypass. While, 6% (36) were gastric banding, and 2% (12) were other procedures. The median interval from surgery to delivery was 2 ± 1 years. The mean presurgery BMI was 41.2 ± 4.9 . when comparing control and interventional group, control group had higher BMI in early pregnancy but this deference is not significant. Otherwise, both groups were comparable in age, education and parity (Table 1).

Table 1: Participants characteristic

Characteristics	Intervention group 603 (100%)	Control group 1809 (100%)	P
Age (in years)			
mean	31±5	31±5	
18- <25 y	45 (7.5%)	137 (7.6%)	
25- <30 y	178 (29.5%)	531 (29.4%)	
30- <35 y	235 (39%)	705 (39%)	
35- <40 y	111 (18.4%)	336 (18.6%)	
≥40 y	34 (5.6%)	100 (5.4%)	0.4
BMI before bariatric surgery			
mean	41.2±4.9		
	12 (2%)		
30-34.9	182 (30.2%)		
35-39.9	276 (45.8%)		
40-44.9	90 (14.9%)		
45-49.9	43 (7.1%)		
≥50			
BMI in early pregnancy			
mean	27.2±4.1	32.1±3.8	
	2 (0.3%)	0	
<18.5	89 (14.8%)	0	
18.5-24.9	235 (39%)	29 (1.6%)	
25-29.9	213 (35.3%)	674 (37.3%)	
30-34.9	47 (7.8%)	992 (54.8%)	
35-39.9	17 (2.8%)	114 (6.3%)	0.15
≥40			
Surgery-delivery interval (y)			
mean	2±1		
	46 (7.6%)		
<1 y	189 (31.3%)		
1-<2 y	361 (59.9%)		
2-<5 y	7 (1.2%)		
≥5 y			
Education High school			
	23 (3.8%)	71 (4%)	
Bachelor	407 (67.5%)	1303 (72%)	
Masters	130 (21.6%)	368(20.3%)	
PhD	43 (7.1%)	67 3.7%)	0.21
Parity			
nullipara	76 (12.6%)	224 (12.4%)	
1-2	211 (35%)	666 (36.8%)	
3-4	301 (49.9%)	879 (48.6%)	
≥5	15 (2.5%)	40 (2.2%)	0.11

Gestational diabetes was diagnosed in 2% of the intervention group pregnancies and in 15.9% of the control group pregnancies, this difference was significant P value 0.02 (Table 2). Added to that, the difference between women in both groups who needed insulin to control gestational diabetes mellitus was also significant P 0.01. on the other hand, presence of macrosomia between both groups was also significant P 0.01.

Regarding all the secondary outcomes, the difference was also significant except regarding intrauterine fetal death P 0.1 (Table 2).

Table 2: Outcomes

Variables	Intervention group 603 (100%)	Control group 1809 (100%)	P
GDM	12 (2%)	287 (15.9%)	0.02
Total Insulin treated	4 (0.7%)	205 (11.3%)	0.01
Macrosomia	6 (1%)	146 (8.1%)	0.01
Operative delivery	31 (5.1%)	537 (29.7%)	0.05
Total	31 (5.1%)	523 (28.9%)	0.05
LSCS	0	11 (0.6%)	0.01
Ventous	0	3 (0.2%)	0.04
Forceps			
Preterm birth	34 (5.6%)	101 (5.6%)	0.06
Congenital malformation	3 (0.5%)	13 (0.7%)	0.01
IUFD	1 (0.2%)	3 (0.2%)	0.1
Neonatal mortality	3 (0.5%)	19 (1.1%)	0.01

DISCUSSION

This was a multicenter study conducted in six ministry of health hospitals in Al-Baha area. Women with history of bariatric surgery had a lower risk of gestational diabetes and infant macrosomia than did women in a control group matched for presurgery BMI and both outcomes were significant. Previous studies reported inconsistent results regarding the effect of bariatric surgery on the development of gestational diabetes. These inconsistencies are most likely explained by small sample sizes and heterogeneous study designs. In one previous study in which, as in the present study, cases were matched to controls according to presurgery BMI, there were no cases of gestational diabetes among 70 women who had a history of bariatric surgery and 21 cases among 140 matched controls [13]. On another study, gestational diabetes was diagnosed in 1.9% of the women who had undergone bariatric surgery and in 6.8% of matched controls and this difference was significant [14].

Overall, bariatric surgery women did not have a significantly higher risk of preterm birth, but operative deliveries according to type or in total were significantly less in them than matched women in control group. Similar associations were reported from two cohort studies in which cases and controls were matched for early-pregnancy BMI, although such a design addresses a different research question than does the current study.

The between-group difference in fetal growth was expected, given that the women with a history of bariatric surgery had, on average, a decrease in weight of 39 kg (decrease in BMI 14) after surgery. However, given the direct association between BMI and the risk of preterm birth, explains lower preterm birth after bariatric surgery.

Despite known adverse effects of gastric bypass surgery on the metabolism of iron, vitamin B12, and folate, there was no significant effect of bariatric surgery on the overall risk of congenital malformations. Still, risks of specific malformations between the groups cannot be excluded.

Equivalently, risk of congenital malformations was significantly less in bariatric surgery women. This can be explained by the presence of some chromosomal congenital malformations not excluded since it was not specified in research methodology.

One previous study also reported perinatal mortality of 5.7% among pregnancies in women with a history of bariatric surgery and a rate of 0.7% among the control pregnancies [13]. Similarly, in other study, they reported neonatal death among women with a history of bariatric surgery more than in the controls (1.7% vs. 0.7%), but this was not significant $P = 0.06$ [14]. Inversely, in this study neonatal mortality and congenital anomalies were significantly less in bariatric surgery women than matched women in control group $P = 0.01$ in both outcomes.

This study had few limitations, one of them is the retrospective design which makes it impossible to determine cause and effect. There may be residual confounding, because women who undergo surgery may have differed from women in the control group with respect to other factors not accounted for in the analyses. Also, there is a possibility of chance findings, since this study investigated multiple outcomes.

CONCLUSIONS

This study showed that a history of bariatric surgery may be associated with reduced risks of gestational diabetes, macrosomia, operative deliveries, congenital malformation and neonatal mortality. However, a history of bariatric surgery was not changing the fact that these women still prone to preterm birth and intrauterine fetal death. More research needed in this area since obesity is one of the large problems in Saudi Arabia and bariatric surgery is one of the solutions. Research in this area should be of larger scale, nationwide, and should look at all the important outcomes in details.

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