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Research Article

Outcome of Massive Obstetric Hemorrhage in Obese Maternal Population in Tertiary Hospital in the Middle East: A Two Years Review

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Abstract

Introduction: Obesity is a significant health problem in the world, where Qatar is ranked sixth in obesity prevalence globally [1]. Several studies have reported that maternal obesity is associated with increased risk of post-partum hemorrhage. Postpartum hemorrhage (PPH) is an obstetric emergency. It is one of the top five causes of maternal mortality in both high and low per capita income countries [2]. This study will help us understand the outcome of massive obstetric hemorrhage in obese maternal population in a Middle Eastern country Qatar.

Objective:

- To review the outcome of massive obstetric hemorrhage in obese pregnant population in Women hospital Doha Qatar.
- To study if obese pregnant population is associated with more adverse maternal outcomes of massive post-partum hemorrhage than non-obese pregnant population.

Study Design: A retrospective cohort analysis of massive obstetric hemorrhages from a validated maternity database system, over 24 months between January 2016 and December 2017 (n = 225), at women hospital Doha, Qatar.

Methods:

- **Inclusion Criteria:** Women giving birth at women wellness and research center (WWRC), between January 2016 and December 2017 that developed massive PPH (N = 225).
- **Exclusion Criteria:** None.
- **Main Outcome:** Maternal morbidity in terms of infection, blood transfusions, SICU admissions, and hysterectomies, maternal death.

Results: Between January 2016 and December 2017 thirty-two thousand and sixty-five (n = 32,065) deliveries were conducted in Women hospital Doha. Two hundred and twenty-seven (n = 225, 0.7%) patients had massive postpartum hemorrhage.

We divided cohort of 225 patients into obese and non-obese groups based on WHO BMI classification. In our study cohort 60% (n = 159) of patients were obese however in terms of maternal outcome like hysterectomies (4.5%), DIC (3.2%) and admission in surgical ICU (3.2%) were not significantly different than the non-obese group 40% (n = 69).

Conclusions: In our study outcome of massive postpartum hemorrhage in obese mothers was not significantly different from the non-obese mothers. These outcomes include estimated blood loss, hemoglobin after delivery, hysterectomies, surgical intensive care admission, and maternal mortality. The study findings may be because of the specific cohort characteristics and high standard of care offered to them by multidisciplinary team in Women Hospital Doha.

Keywords: *Blood Loss; Postpartum Hemorrhage; Observational Study; Pregnancy; Maternal Obesity; Severe Adverse Maternal Morbidity*

Introduction

Obesity is a significant health problem in the world, where Qatar is ranked sixth in obesity prevalence globally. For the past, few decades the number of people classified as overweight or obese has continued to rise and Qatar is now facing an obesity epidemic which has serious consequences. The 2012 STEPS report suggests a significant obesity epidemic in Qatar [1]. However currently we do not have censes or demographics about obesity in pregnant population of Qatar.

Several studies have reported that maternal obesity is associated with increased risk of post-partum hemorrhage. Obesity in itself appears to have an adverse effect on uterine contractility because of hypercholesterolemia and increased leptin. This effect is independent of macrosomia, gestation, or maternal age. Research into the biological and physiological basis that underlies this theory is growing.

Postpartum hemorrhage (PPH) is an obstetric emergency. It is one of the top five causes of maternal mortality in both high and low per capita income countries [2]. Primary postpartum hemorrhage (PPH) is the most common form of massive obstetric hemorrhage.

This study will help us understand the outcome of major obstetric hemorrhage in obese maternal population in a Middle Eastern country Qatar.

Objective of the Study

1- To review the outcome of massive obstetric hemorrhage in obese pregnant population in Women hospital Doha Qatar.

2- To study if obese pregnant population is associated with more adverse maternal outcomes of massive post-partum hemorrhage than non-obese pregnant population.

Study Design

A retrospective cohort analysis of major obstetric hemorrhages from a validated maternity database system, over 24 months between January 2016 and December 2017 (n = 225), at women wellness and research center: Doha, Qatar.

Methods

Inclusion criteria: Women giving birth at women wellness and research center (WWRC), between January 2016 and December 2017, that developed massive PPH (N = 225).

Exclusion criteria: None.

Definition of PPH

For the purpose of this study we have defined and categorize postpartum hemorrhage according to our hospital guideline [3] as:

- Minor Obstetric Hemorrhage: 500 ml - 1000 ml blood loss, with no evidence of clinical shock.
- Major Obstetric Hemorrhage: More than 1000 ml blood loss OR with evidence of clinical shock.
- Massive Obstetric Hemorrhage: Uncontrolled hemorrhage more than 1500 ml OR Acute loss requiring transfusion of > 4 units of PRBC. OR suspicion/evidence of DIC due to hemorrhage.

Definition of overweight and obesity

For the purpose of this study women were classified based on their pre-pregnancy BMI, using WHO Classification of BMI. No patient in our study had BMI less than 18.

Group 1 = Non-Obese → [Normal Weight (18,5 - 24,9 kg/m^2) and Overweight (25,0 - 29,9 kg/m^2)]; N = 69.

Group 2 = Obese [Obese (30,0 - 34,9 kg/m^2), (35,0 - 40,0 kg/m^2) and morbidly obese (> 40 kg/m^2)]; N = 156.

Main outcome

Maternal morbidity in terms of infection, Blood transfusions, Disseminated intravascular coagulopathy (DIC), Surgical Intensive Care Unit (SICU) admissions and hysterectomies.

Results

Between January 2016 and December 2017 thirty-two thousand and sixty-five (n = 32,065) deliveries were conducted in Women hospital Doha. Two hundred and twenty-seven (n = 225, 0.7%) patients had massive postpartum hemorrhage.

We divided cohort of 225 patients into obese and non-obese groups based on WHO BMI classification. Our study group of patients did not have any patient less than 18 BMI.

30.6% (n = 69) were in non-obese group whereas 69.3% (n = 156) were in obese group. More than two third that is about sixty-nine 69.3% (n = 156) patients were in obese group and 30.6% (n = 69) of patients in non-obese group. Mean age of our cohort of obese patients (n =) was 32 ± 0.9 years and mean parity was 2.9 ± 1.9. Mean gestational age was 37.5 ± 0.5 weeks. In obese group of patients 69% had their care in Women hospital Doha and about one third that is thirty one percent (31%) had their antenatal care in other health centers.

In obese patient group 19.4% had Gestational diabetes and 1.9% had pre-existing diabetes. In the same group, Preeclampsia was found in 8.4%, and chronic hypertension was found in 2.9% of patients. Previous history of PPH was found in 3.9% of patients and Macrosomia was present in 13.7% of obese population as compared to 17% in non-obese group. 31.6% had a history of previous cesarean sections in obese group.

Parameters		Group 1 (N = 69)	Group 2 (N = 156)	P value	Significance
Age (years) Means ± SD (Standard deviation)		31.6 ± 1.3	32.1 ± 0.9	0.5	NS (Not Significant)
Gestational Age (weeks) Means ± SD		37.8 ± 0.8	37.5 ± 0.5	0.6	NS
Antenatal Care	Health Centre	12%	14%	0.7	NS
	No ANC	4%	3%	0.7	NS
	Others	6%	7%	0.8	NS
	Private	4%	6%	0.6	NS
	Unknown ANC	0%	1%	0.5	NS
	Women's Hospital	73%	69%	0.5	NS

Table 1: *Demographic data of the patients.*

NS: Not Significant.

SD: Standard deviation

Parameters	Group 1 (N = 69)	Group 2 (N = 156)	P value	Significance	Odd Ratio	95% Coefficient Interval
Previous PPH	1.4%	3.9%	0.3	NS	NA	
Multiple Pregnancy	4.3%	6.5%	0.6	NS	NA	
Macrosomia	17.1%	13.7%	0,5	NS	0.73	0.3 to 2.1
Polyhydramnios	2.9%	2.6%	0,9	NS	0.9	0.2 to 4.9
Chorioamnionitis	2.9%	0.9%	0.2	NS	0.2	0.02 to 2.4
Pre-Existing DM	0	1.9%	0,2	NS	NA	
GDM	17.4%	19.4%	0.7	NS	1.1	0.5 to 2.4
Chronic HTN	2.9%	2.6%	0.9	NS	0.89	0.2 to 4.9
PET	5.8%	6.5%	0.5	NS	1.2	0.3 to 3.8
Previous C.S	17.4%	31.6%	0.03	Significant	2.1	1.1 to 4.4
Placenta Previa	31.9%	25.2%	0.3	NS	0.7	0.4 to 1.3
Abruptio Placenta	4.3%	10.3%	0.1	NS	2.5	0.7 to 9
Pre-Delivery Hemoglobin (g/dl) Means ± SD	11.9 ± 0.3	11.7 ± 0.2	0.7	NS	NA	
Prolonged Second Stage	3.9%	4.3%	0.9	NS	0.9	0.2 to 3.7

Table 2: *Baseline clinical characteristics.*

Fourteen percent 14% were induced in obese group. 21% were delivered by normal delivery, 7% (n = 10) were delivered by forceps delivery, 13.6% were delivered by instrumental delivery, 20% were delivered by elective cesarean section and 44.8% were delivered by cesarean section in obese group. In BMI > 40 group 50% (n = 6) patients were delivered by emergency cesarean section.

Parameters	Group 1 (N = 69)	Group 2 (N = 156)	P value	Significance
Spontaneous Labor	30.4%	17.5%	0.03	Significant
Induced Vaginal Delivery	8.7%	3.9%	0.1	NS
Instrumental Delivery	11.6%	13.6%	0.7	NS
Elective Cesarean Section	14.5%	20.2%	0.3	NS
Emergency Cesarean Section	34.8%	44.8%	0.2	NS

Table 3: *Mode of delivery.*

In overweight and obese group mean blood loss was 2144 ml ± 132.5 and 3.2% (n = 5) were admitted in surgical intensive care unit. 3.2% (n = 5) developed DIC in obese group and 4.5% (n = 7) had hysterectomy for massive postpartum hemorrhage secondary to atony and combined atony and cervical and vaginal lacerations. 1.9% (n = 3) developed surgical site infection. No maternal mortality occurred in our cohort of patients after massive postpartum hemorrhage.

In obese group 23.9% (n = 37) developed atonic postpartum hemorrhage, whereas 40% (n = 62) developed traumatic postpartum hemorrhage, 0.6% (n = 1) had postpartum hemorrhage secondary to retained tissue and 35% (n = 55) had postpartum hemorrhage secondary to combined causes.

Parameters	Group 1 (N = 69)	Group 2 (N = 156)	P value	Significance	Odd Ratio	95% CI
Traumatic	37.7%	40%	0.7	NS	1.1	0.6 to 1.95
Atonic	20.3%	23.9%	0.6	NS	0.8	0.4 to 1.4
Tissue	5.8%	0.6%	0.02	Significant	0.1	0.01 to 0.9
Thrombin	NA	NA	NA	NA	NA	NA
Combined	36.2%	35.5%	0.9	NS	0.5	0.3 to 0.9

***Table 4**: Type of PPH.*

Parameters	Group 1 (N = 69)	Group 2 (N = 156)	P value	Significance	Odd Ratio	95% CI
Estimated blood loss (mls) Means ± SD	2376 ± 332,9	2144 ± 132,5	0.1	NS	NA	
Post Delivery Hemoglobin (g/dl) Means ± SD	8.3 ± 0.3	8.4 ± 0.2	0.5	NS	NA	
Surgical Intensive Care Unit (SICU) Admission	7.4%	3.2%	0.2	NS	0.4	0.1 to 1.2
Hysterectomy	2.9%	4.5%	0.6	NS	1.6	0.3 to 7.8
Surgical site Infection	0	1.9%	0.2	NS	NA	
DIC	2.9%	3.2%	0.9	NS	1.1	0.2 - 5.9
Maternal Mortality	0	0	NA	NA	NA	

***Table 5**: Maternal outcome.*

Discussion

Postpartum hemorrhage (PPH) is an obstetric emergency. It is one of the top five causes of maternal mortality in both high and low per capita income countries, although the absolute risk of death from PPH is much lower in high-income countries [2].

The incidence of PPH varies as it depends upon the classification used to define PPH. RCOG defines Post-partum hemorrhage as loss of (500 ml) or more of blood from the genital tract. PPH can be minor (500 - 1000 ml) or major (more than 1000 ml). Major can be further subdivided into moderate (1001 - 2000 ml) and severe (more than 2000 ml) [4].

Our hospital PPH guideline [3] defines PPH as minor (500 ml - 1000 ml blood loss, with no evidence of clinical shock), major > 1000 ml loss or with evidence of clinical shock and massive if blood loss is > than 1500 ml, or acute loss requiring blood transfusion of > 4 unit of PRBC or evidence of DIC due to hemorrhage.

A reasonable estimate of PPH incidence is 1 to 5 percent of deliveries [5,6]. In our study, we found less than 1% (0.7%) PPH in 32,065 patients over the period of 24 months. Most of the patients in study cohort had their antenatal care in Women hospital which is a tertiary care center for pregnant women in Qatar. This was applicable for both obese (69%) and non-obese pregnant women (73%).

There is an association with pregnancy and hypercholesterolemia, which is further increased in obese patients. This altered cholesterol levels may adversely affected the ability of the myometrial cells to contract. Dyslipidemias result in changes in membrane viscosity and fluidity, which in turn affects the calcium ion influx during the contraction-relaxation of smooth muscle, thereby having a negative effect on contractility. Leptin is an adipose-derived hormone which has a role in metabolism and appetite stimulation. Leptin concentrations are known to be increased in obese individuals. One possible mechanism that may increase the risk of bleeding is the malfunction in uterine contractility secondary to increased cholesterol and leptin [7].

Various studies have found associations of above risk factors/baseline characteristics with post-partum hemorrhage. Women with a prior PPH have as much as a 15 percent risk of recurrence in a subsequent pregnancy [8,9]. We compared baseline characteristics (risk factors for PPH) between the two groups and found no significant difference between the obese and non-obese groups e.g. previous history of PPH, History of previous cesarean section, multiple pregnancies, macrosomia, gestational diabetes, preeclampsia, placenta Previa and placenta abruption. However, history of previous cesarean sections was found two times more in obese group and reached statistical significance (31.6%, p = 0.03, OR 2.1,95% CI 1.1 - 4.4). In other words, obese pregnant women with previous history of cesarean sections are two-fold more prone to have massive PPH. It might be explained by association of previous cesarean and placenta previa and accreta?

Similarly, gestational diabetes is mostly associated with obese pregnant women (A). The prevalence of gestational diabetes mellitus (GDM) is significantly higher in obese women than in the general obstetrical population [10,11] and the risk increases with increasing maternal weight and BMI [12-14]. The increased risk of GDM is related to an exaggerated increase in insulin resistance in the obese state [15]. In a systematic review of studies on pre-pregnancy BMI and risk of GDM, the prevalence of GDM increased by 0.92 percent for every 1 kg/m^2 increase in BMI [12]. In our cohort of patients, we found 17.4% gestational diabetes in non-obese group versus 19.4% gestational diabetes in obese group (p = 0.7,95% CI 0.5 - 2.4). This perhaps indicate towards a high prevalence of gestational diabetes in our pregnant population in Qatar (24.0% (95% CI 22.1 - 25.9) [16] which seemed to be independent of maternal weight in this study cohort. This may be due to increased genetic predisposition of our population to Gestational diabetes and needs more studies to confirm.

An association between obesity and hypertensive disorders during pregnancy has been consistently reported. In particular, maternal weight and BMI are independent risk factors for preeclampsia, as well as other hypertensive disorders [17,18]. In a systematic review of 13 cohort studies comprising nearly 1.4 million women, the risk of preeclampsia doubled with each 5 to 7 kg/m^2 increase in pre-pregnancy BMI [19]. Cohort studies of women who underwent bariatric surgery suggest that weight loss significantly reduces the occurrence of preeclampsia [20]. In our study, Preeclampsia was almost equally present in both groups (non-obese 5.8%, Obese 6.5%) and did not reached statistical significance (p = 0.5,95% CI 0.3 - 3.8).

Placenta previa and placenta accreta are risk factors for PPH and are associated with increase maternal morbidity and mortality [21,22]. With increasing number of repeat Cesarean sections, incidence of placenta previa and accreta continue to rise. This is especially true for our maternal population in Qatar where it is not uncommon to see more than previous five cesarean sections. In our study cohort 30.6% (n = 69) patients in had placenta previa. An interesting observation was made for placental previa which again did not reached statistical significance for both groups. In our study 25% placenta previa were in obese group and 32% in non-obese group (p = 0.7, 95%CI 0.4 - 1.3).

30.4% (p = 0.03) of patients went into spontaneous labor in non-obese group which was statistically significant observation as compared to the 17.5% of obese group. This observation is confirmed by Frolova AI., *et al.* where their study showed that obese women at or beyond 37 weeks are less likely to experience spontaneous labor compared with non-obese women [23]. In the same study, they found that obese women had lower rates of spontaneous labor than non-obese women at every gestational week (37 weeks, 6.1 vs. 9.3%, $p < 0.001$; 38 weeks, 12.8 vs. 19.2%, $p < 0.001$; 39 weeks 26.0 vs. 37.0%, $p < 0.001$; 40 weeks, 39.6 vs. 50.2%, $p < 0.001$; 41 weeks, 30.8 vs.38.0%, $p < 0.012$), which suggest that spontaneous labor is more common in non-obese pregnant ladies. This might also be explained by the fact that obese patients are more prone to be induced before getting into labor for various conditions related to obesity e.g. pregnancy induced hypertension, preeclampsia, gestational diabetes etc.

Obesity is a risk factor for both elective and emergency cesarean delivery, and the risk increases with increasing maternal weight [24,25]. In one study, each unit increase in pre- pregnancy BMI resulted in a 7 percent increase in risk of cesarean delivery [25].

We also observed in our study that Obese group had more emergency cesarean sections (45%) than non-obese group (35%), however it did not reach statistical significance (p = 0.2). Yet this association is important to observe, especially when counselling the obese mothers for complications associated with obesity. Similarly, Obese group had more elective cesarean sections 20% as compare to 14.5% in non-obese group (p = 0.3). Poobalan AS, Aucott LS, Gurung T., *et al*. [24] investigated the association between increasing maternal body mass index (BMI) and elective/emergency caesarean delivery rates. They found Caesarean delivery risk is increased by 50% in overweight women and is more than double for obese women compared with women with normal BMI. Instrumental deliveries were slightly more (14%) in obese group than non-obese group (12%), and did not reached significance (p = 0.7, 0.3).

In our study cohort 60% (n = 159) of patients were obese however in terms of maternal outcome were not significantly different than the non-obese group. Most of the literature suggests that Obesity is associated with adverse maternal outcomes, however this is not demonstrated by our observational study. The reason might be high standard of multidisciplinary care offered to this high-risk group, departmental PPH guidelines and risk management department.

Maternal mortality after PPH averages approximately 2 percent, with wide variations worldwide depending on both the overall health of pregnant women in the population and the resources for treatment of PPH [26]. In our study by the Grace of God there was no maternal mortality.

In our study, we found 4.5% hysterectomy in obese group as compared to 2.9% in non-obese group. This was not statistically significant; however, it did suggest that hysterectomy was more common in obese group (OR 1.6, 95% CI 0.3 - 7.8). In the WOMAN trial 3.5 percent of women underwent peripartum hysterectomy because of PPH [27]. In the United States, 2.5 percent of women with PPH underwent hysterectomy in 2012 - 2013 [28]. Hysterectomy was more common in PPH without atony than with atony (6.6 versus 1.0 percent). An early hysterectomy is recommended for severe bleeding as a result of placenta accreta or uterine rupture [4,21,29]. The decision for hysterectomy should be made by an experienced consultant clinician and the decision preferably discussed with a second experienced clinician when feasible [30]. However, in women with uterine atony who have ongoing bleeding in spite of an adequate transfusion, it may be reasonable to consider a trial of rFVIIa before a hysterectomy [29].

A critical feature of a massive hemorrhage in obstetrics is the development of disseminated intravascular coagulation (DIC) [29]. The prevalence of DIC in pregnancy ranges from 0.03 to 0.35 percent in population-based studies [31] or 12.5 per 10,000 delivery hospitalizations (0.13 percent) in one study [31]. Pregnancy-associated DIC accounts for approximately 1 to 5 percent of all cases of DIC in high-resource countries; the proportion of DIC cases attributable to pregnancy complications is higher in low-resource countries [32]. In our study there was no Statistical difference between obese (3.2%) and non-obese group (2.9%, OR1.1,95% CI 0.2 - 5.9).

The most common cause of PPH is uterine atony [4,33]. Some of the studies has found an association of obesity [34] with atonic postpartum hemorrhage, our study also confirmed this association to lesser extend and was not significantly associated. The percentage of atonic hemorrhage in obese (24%) and non- obese group (20%) (OR 0.8) (95% CI 0.4 - 1.4). Most of the causes of postpartum hemorrhages remain almost same in both groups, however retained tissue had a significant association with non-obese group 5.8% p = 0.02, OR 0.195% CI 0.01 - 0.9) as compared to 0.6% in obese group.

Maternal outcomes in both obese and non-obese groups have been good. This might be because of availability of experienced multidisciplinary team (Senior Obstetricians and Gynecologists, Senior Anesthetists, Intensivist, hematologists, Blood bank, surgical ICU and departmental PPH guidelines in Women's hospital Doha.

Also, numbers of hysterectomies are lower as compare to international rates. This is because of cultural pressure/drive to save the uterus by the patient and families. This has led to reduction in hysterectomies with increase in massive blood transfusions for our patients. Although the RCOG recommends considering early hysterectomy in cases of massive postpartum hemorrhage the norm in our unit is to try to preserve uterus as much as possible because of requests from patients wishing to have larger families. Most of these patients are treated with Bakri uterine Balloon insertions, compression B lynch sutures and ligation of anterior branch of internal iliac arteries.

Conclusion

In our study outcome of massive postpartum hemorrhage in obese mothers was not significantly different from the non-obese mothers. These outcomes include estimated blood loss, hemoglobin after delivery, hysterectomies, surgical intensive care admission, and maternal mortality. The study findings may be because of the specific cohort characteristics and high standard of care offered to them by multidisciplinary team in Women Hospital Doha.

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