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Original Research Article

Maternal and perinatal outcomes in pregnancy with high BMI in the Jabal Akhdar region of Libya

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ABSTRACT

Background: Overweight maternal pre-pregnancy, obesity and excessive gestational weight gain are significant risk factors for unfavorable maternal and perinatal outcomes during pregnancy. The association of obesity with maternal and perinatal outcomes is poorly understood in Jabal Akhdar region of Libya. This study was to examine maternal and perinatal outcomes in obese mothers compared to non-obese mothers in Jabal Akhdar region of Libya.
Methods: This is a Cross sectional survey design study with internal comparison groups. The study was conducted between May 2015 and May 2016 in Jabal Akhdar region od Libya. A total of 415 women at reproductive age were deemed eligible for this study. BMI categories were defined as; underweight (BMI< 18.5), normal (BMI 18.5 - 24.99), overweight (BMI 25 - 29.99), grade I obesity (BMI 30 - 34.99), grade II obesity (BMI 35 - 39.99) and grade III obesity (BMI 40+). Data obtained in this study was analysed using SPSS, version 17.0 was used in analysis.
Results: Of 415 women included in this study, 282 had a BMI <30 kg/m^2 and 133 women had a BMI >30 kg/m^2. Pregnancy-induced hypertension was more prevalent in obese mothers compared to non-obese women. The rate of operative delivery and caesarean section were also demonstrated between obese and non-obese mothers and these differences were significant.
Conclusions: This study demonstrates extent of obstetric risks associated with obesity in pregnancy, though more research is required to fully elucidate the effect that maternal obesity is having on maternal and perinatal outcomes in pregnancy in Libyan populations. Since high weight gain is a modifiable risk factor, pre pregnancy health education awareness of health care providers, good behavioral counseling and weight control program during pregnancy should help to modify this risk.

Keywords: Caesarean section, Jabal Akhdar, Maternal obesity, Maternal outcomes, Pregnancy

INTRODUCTION

Improvements of maternal, perinatal and child health are public health priorities. Maternal pre pregnancy body mass index (BMI) has noticeably increased among women of reproductive age in developed countries. In the United States, obesity is prevalent in more than one third of women, as well as more than one half of pregnant women. 8% of women at reproductive age are considered extremely obese, which make them at greater risk of pregnancy adverse outcomes.[1, 2]

Rao AK et al (2006), described a significant difference in perinatal outcomes among subgroups of the Asian American and Pacific Islander community and advised that mothers should be counseled regarding perinatal risk according to their specific Asian subgroup.[3] Ota E, et al (2011) revealed that African women were at higher risk of having a very small infant compared with Caucasian women.[4]

Overweight maternal pre-pregnancy, obesity and excessive gestational weight gain (GWG) are significant

risk factors for unfavorable outcomes during pregnancy.[1] These include, miscarriage, pregnancy-induced hypertension, gestational diabetes, operative delivery, as well as fetal macrosomia.[1] Most of these complications are significantly evident beyond BMI of 30 kg/m^2.[5]

In a large Sweden prospective population-based cohort study of 245,526 singleton term pregnancies, obese women with low GWG had less risk for preeclampsia, caesarean section, instrumental delivery, and small for gestational age (SGA) births.

There is a 2-fold increased risk for preeclampsia and large for gestational age (LGA) infants among normal and overweight women if they have excessive GWG. High GWG increases the risk for caesarean delivery in all maternal BMI categories.[6]

Severe obesity also presents a number of technical issues such as intravenous access, administration of neuraxial analgesia, intubation and availability of specialised operating equipment.[7,8]

Due to the rising number of obese mothers in the Green Mountain region in Libya and the likely rise in obstetric complications and interventions in the future, it is important that this is established.

The aim of this study was to evaluate the maternal and perinatal outcomes in women with a high BMI in the Jabal Akhdar region of Libya.

METHODS

This is a Cross sectional survey design study with internal comparison groups. The study was conducted between May 2015 and May 2016. A total of 415 women at reproductive age in Al Bayda Central Hospital and Al Marj Hospital in Jabal Akhdar (green mountain) region at the east of Libya were deemed eligible for this study. The study was approved by the local hospital ethical committee. No identifiable patient data was collected at any point. BMI categories were defined as; underweight (BMI< 18.5), normal (BMI 18.5 – 24.99), overweight (BMI 25 – 29.99), grade I obesity (BMI 30 – 34.99), grade II obesity (BMI 35 – 39.99) and grade III obesity (BMI 40+).

Statistical analysis

Data obtained in this study was analysed using SPSS, version 17.0 was used in analysis.

Categorical variables were tabulated in proportions and measurement variables were described after checking normality with corrected Kolmogorov – Smirnov test for homogeneity.

Analysis tools

To check associations of BMI with different outcomes, first classes were grouped into normal/subnormal weight and overweight/obese. G- test (chi- squared for likelihood ratios) was used to analyze independence and alternatively Fisher exact test when chi square is not appropriate. For outcomes with significant associations, reanalysis was performed using receiver operating characteristic (ROC) curve analysis for assessing power of the BMI in prediction of different outcomes found significantly dependent in the priori analysis and for setting the best BMI cutoff value to predict those complications.

RESULTS

Demographic and personal characteristics

The mean age of the women included in the study was 28 years (18 to 44 years) All women were from the largest two hospitals in Jabal Akhdar in the east of Libya, 65.8% of cases were from Bayda Central Hospital and the others were from Al Marj Hospital.

BMI was categorized into 5 groups; underweight (BMI< 18.5), normal (BMI 18.5 – 24.99), overweight (BMI 25 – 29.99), grade I obesity (BMI 30 – 34.99), grade II obesity (BMI 35 – 39.99) and grade III obesity (BMI 40+).

Table 1: Maternal outcomes distribution in Jabal Akhdar.

Outcome	Frequency	Percent
Operative delivery	101	24.3
Induction of labor	34	8.2
Pregnancy induced hypertension	15	3.6
Postpartum hemorrhage	13	3.1
Gestational diabetes	3	0.7
Perineal trauma	3	0.7
Any hospital admission this pregnancy	2	0.5
Evidence of surgery/anesthesia complications	2	0.5
Antepartum hemorrhage	1	0.2

Table 2: Fetal outcomes distribution in Jabal Akhdar.

Outcome	Frequency	Percent
Any neonatal admission	103	24.8
Evidence of fetal distress	56	13.5
Premature rupture of membranes	50	12.0
Perinatal death	15	3.6
Neonatal hypoglycemia	2	0.5
Birth asphyxia	1	0.2
Fetal birth trauma	0	0

Adverse outcomes (dependent characters) distributions

Operative delivery, induced labor, pregnancy induced hypertension and postpartum hemorrhage were the most frequent maternal complications (Table 1). While, neonatal admissions, fetal distress and premature rupture of membranes were the most frequent fetal outcomes encountered (Table 2).

Mean birth weight was 3.373 kg (95% CI: 3.32 – 3.425 kg; range of 1.2 – 5.0 kg and median of 3.4 kg). Birth weight was not fit to normal distribution assumption (corrected Kolmogorov-Smirnov statistic=0.087 with P value of 0.000).

Analysis of associations between maternal weight status and different maternal and fretal outcomes

Statistically significant differences between obese and non-obese mothers were determined in terms of pregnancy induced hypertension with rate of 5% for 0% in normal/under weight category (Tables 3 and 4), operative delivery with rate of 27.8% for 15% in normal/under weight category (Tables 5 and 6), occurrence of any maternal event with rate of 41.7% for 22.1% in normal/under weight category (Tables 5 and 7) and abnormal birth weight with rate of 8.6% for 2.7% in normal/under weight category (Tables 5 and 8).

Table 3: Statistical association of maternal outcomes with BMI status in Jabal Akhdar.

Outcome	Test	Test value	P value	Note
Any hospital admission this pregnancy	Fisher's Exact	-	0.529	50% of EV <5
PIH	Fisher's Exact	-	0.008*	25% of EV <5
	Phi test	0.118	0.016*	
Gestational diabetes	Fisher's Exact	-	0.384	50% of EV <5
Ante partum hemorrhage	Fisher's Exact	-	0.728	50% of EV <5
Postpartum hemorrhage	Fisher's Exact	-	0.509	25% of EV <5
Perineal trauma	Fisher's Exact	-	0.616	50% of EV <5
Post-operative complications	Fisher's Exact	-	0.529	50% of EV <5
Induction of labor	Likelihood Ratio	3.287	0.070	-
Mode of delivery	Likelihood Ratio	7.812	0.005*	-
Any maternal complication	Likelihood Ratio	14.372	0.000*	

EV=expected values of contingency table, * =statistically significant difference

Table 4: Distribution of pregnancy induced hypertension according to maternal weight status in Jabal Akhdar.

Maternal weight status	Pregnancy induced hypertension		Total
	Yes	No	
Overweight or obese	15	287	302
	5.0%	95.0%	100%
Underweight or normal	0	113	113
	0.0%	100.0%	100%
Total	15	400	415
	3.6%	96.4%	100%

Table 5: Statistical independence of fetal outcomes from maternal weight status in Jabal Akhdar.

Outcome	Test	Test value	P value	Note
Premature rupture of membranes	Likelihood Ratio	0.306	0.580	-
Maturity	Likelihood Ratio	1.165	0.558	-
Fetal distress	Likelihood Ratio	1.147	0.284	-
Birth asphyxia	Fisher's Exact	-	0.728	50% of EV <5
Neonatal hypoglycemia	Fisher's Exact	-	0.529	50% of EV<5
Large for gestational age (LG)A	Likelihood Ratio	5.354	**0.021***	-
Any neonatal admission	Likelihood Ratio	2.466	0.116	-
Perinatal death	Fisher's Exact	-	0.612	25% of EV<5
Any fetal complication	Likelihood Ratio	3.130	0.077	-

EV=expected values of contingency table, * =statistically significant difference

Table 6: Distribution of mode of delivery according to maternal weight status in Jabal Akhdar.

Maternal weight status	Mode of delivery		Total
	C/S or assisted delivery	Normal delivery	
Overweight or obese	84	218	302
	27.8%	72.2%	100%
Underweight or normal	17	96	113
	15.0%	85.0%	100%
Total	101	314	415
	24.3%	75.7%	100%

Table 7: Distribution of any maternal event according to maternal weight status in Jabal Akhdar.

Maternal weight status	Any maternal complication		Total
	Yes	No	
Overweight or obese	126	176	302
	41.7%	58.3%	100%
Underweight or normal	25	88	113
	22.1%	77.9%	100%
Total	151	264	415
	36.4%	63.6%	100%

Table 8: Distribution of birth weight status according to maternal weight status in Jabal Akhdar.

Maternal weight status	Baby not of normal birth weight		Total
	Yes	No	
Overweight or obese	26	276	302
	8.6%	91.4%	100%
Underweight or normal	3	110	113
	2.7%	97.3%	100%
Total	29	386	415
	7.0%	93.0%	100%

Table 9: Analysis of ROC for BMI and maternal complications in Jabal Akhdar.

Maternal events	AUC	Suggested cut off point of BMI	Sensitivity	Specificity	Notes
Any hospital admission	0.912	33.18	100%	84%	
PIH	0.716	29.76	66.7%	69%	
GDM	0.798	35.77	66.7%	91.7%	
PPH	0.469	-			Worthless test
POC	0.964	36.72	100%	93.7%	
Induction of labor	0.531	25.90	82.4%	35.2%	
Mode of delivery	0.675	24.89	86.1%	30.3%	
PROM	0.502	26.0	66%	34.8%	
Any maternal complication	0.661	27.10	69.5%	50.8%	

PIH; pregnancy induced hypertension, GDM; gestational diabetes, PPH; post-partum hemorrhage, POC; post-operative complications, PROM; premature rupture of membranes.

Analysis of power of BMI for predicting maternal and fretal outcomes

Using ROC curves analysis, the highest power according to area under the curve (AUC) was for predicting any hospital admission and post operative complications (0.912 and 0.964 respectively) and best suggested BMI cut off point of 33.18 kg/m2 and 36.72 kg/m2 respectively, (Table 9). The prediction seemed to have less powerful among fetal complications. Birth asphyxia and neonatal hypoglycemia had the highest AUC in analysis (0.783 and 0.693 respectively) with best suggested BMI cut off points of 31.64 kg/m2 and 27.66 kg/m 2 respectively, (Table 10). The levels of BMI less than 25 kg/m^2 is likely to be enough to guarantee exclusion of at least two thirds of any complication.

Table 10: Analysis of ROC for BMI and fetal complications in Jabal Akhdar.

Fetal (perinatal) events	AUC	Suggested cut off point of BMI	Sensitivity	Specificity	Notes
Term delivery	0.510	25.58	67.1%	31.6%	
Evidence of fetal distress	0.555	26.37	75%	39.3%	
Birth asphyxia	0.783	31.64	100%	88.3%	
Neonatal hypoglycemia	0.693	27.66	100%	49.2%	
Baby not of normal birth weight	0.633	25.90	79.3%	34.7%	
Any neonatal admission	0.584	25.67	73.8%	34.6%	
Perinatal death	0.506	25.67	66.7%	32.5%	
Any fetal complication	0.571	26.23	69.3%	42.3%	

DISCUSSION

In this cross-sectional study, operative delivery, induced labour, pregnancy induced hypertension and post-partum hemorrhage were the most frequent maternal complications. While, neonatal admissions, fetal distress and premature rupture of membranes were the most frequent fetal outcomes encountered.

We found a number of significant differences in terms of maternal and perinatal outcomes between obese and non-obese mothers in this cohort population. Pregnancy-induced hypertension was more prevalent in obese mothers, which is consistent with findings in previous reports.[9-12] Statistically significant variation in maternal and perinatal outcomes such as operative delivery and caesarean section were also demonstrated between obese and non-obese mothers.

Fetal macrosomia is a well-established adverse consequence of maternal obesity.[13] A 2014 meta-analysis, including thirty studies from various countries excluding Ireland, found that maternal obesity was associated with a significant increase in birthweight >4000g (OR 2.17, 95% CI 1.92-2.45) and >4500g (OR 2.77, 95% CI 2.22-3.45).[14] Owens LA, et al (2010) found that the percentage of macrosomic neonates (more than 4,000 g) was increased from 15.5% to 21.4% to 27.8% in normal-weight, overweight, and obese women, respectively. Our study showed that abnormal birth weight with rate of 8.6% for 2.7% in normal/under weight category.[15]

In our study, the rate of operative delivery increased in obese women compared to non-obese women. A meta-analysis performed by Chu et al (2007).[16] estimated that the risk of having a caesarean delivery was approximately two and three times higher among obese and severely obese women, respectively, compared with women of normal weight. The reason for this increased rate of caesarean delivery in obese women is yet not well explained but could be related to increased maternal pelvic soft tissue, fetal macrosomia, and intrapartum complications (e.g. inability to adequately monitor the fetus and contractions).[17]

It is well known that overweight, obesity, and severe obesity increase morbidity for both mother and neonate and are associated with a variety of adverse pregnancy outcomes. Obese women undergoing caesarean delivery experience more complications, including blood loss more than 1,000 mL, increased operative time, increased postoperative wound infection, and endometritis. In our study, occurrence of any maternal event with rate of 41.7% versus 22.1% in normal/under weight category is still supporting evidence for increased risk of maternal obesity and overweight.[18]

Nohr EA et al (2008).[19] reported an increased risk for gestational diabetes mellitus (GDM) in overweight women of 1.7 times, and 5.1 in obese women while Chu SY et al(2007).[16] included 20 studies in a meta-analysis and found that the risk of developing GDM was increased 3.6 times in obese compared with normal-weight women, and 8.6 times in the severely obese. This is not in line with our findings for GDM.

As maternal obesity is a growing problem associated with multiple adverse events in pregnancy, as demonstrated in this study and previous research, it is crucial to reduce this burden and encourage the implantation of effective intervention strategies for obesity to improve obstetric care in Libya. However, more comprehensive research in this area in Libyan populations is needed to fully understand the extent of the problem and allow for strategic planning and adequate allocation of resources.

CONCLUSION

This study demonstrates extent of obstetric risks associated with obesity in pregnancy, though more research is required to fully elucidate the effect that maternal obesity is having on maternal and perinatal outcomes in pregnancy in Libyan populations. Maternal obesity is likely having an adverse effect on pregnancy that will continue to increase with rising maternal obesity rates. Since high weight gain is a modifiable risk factor, pre pregnancy health education awareness of health care providers, good behavioral counseling and weight control program during pregnancy should help to modify this

risk. Implementation of effective intervention strategies to reduce the number of obese women in pregnancy may have beneficial effects on pregnancy outcomes in Libya.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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