

The effects of maternal obesity on pregnancy outcomes in Misurata, Libya

Buthiena Gerriw⁽¹⁾, Muftah Sawan¹, Nadia Mangoush⁽¹⁾, Alia Zwawa¹ and Nahla Betelmal⁽²⁾⁽¹⁾Obstetrics and Gynecology Department, Faculty of Medicine, Misurata University, Libya.⁽²⁾Glasgow Caledonian University, UK.

Abstract

Background: Obesity is a global epidemic resulting in major morbidity and premature death. In Libya, prevalence of adult obesity has nearly tripled over last 30 years. Obesity can affect pregnancy by causing issues during antepartum, intrapartum and postpartum periods.

Aims: To estimate obesity rates of pregnant women in Misurata Public Hospital, Libya and to evaluate the relationship of overweight/obese mothers with maternal complications and perinatal macrosomia.

Methods: A cross-sectional study performed over two months period. One-hundred and forty nine participants from the only one public hospital in Misurata city, were interviewed twice. The first interview occurred after admission to the labor ward and the second occurred during the first 24 hours after delivery. Women were classified according to their body mass index into two groups: first group, their body mass index was 25 or less (normal weight) and second group, their body mass index was more than 25 (overweight/obese).

Results: Obesity/ overweight occurred in 99 cases at rate of 66.4% [obese; 41.6%& overweight; 24.8%]. Maternal obesity was associated with older age group (mean age 29 + 6.56 years), The presence of co-morbidities (including gestational diabetes mellitus, hypertension and anemia) were more in obese participants compared to non-obese participants (25.1% versus 3%). Obesity increases odd ratio (OR) of having cesarean section (C/S) (OR= 4.19, P-value= 0.04, 95% CI: 1.70- 16.15), OR increases more in cases of history of a previous caesarean section (OR= 3.02, P-value <0.00, 95% CI: 1.80- 5.74), and presence of current co-morbidities (OR= 2.36, P-value= 0.08, 95% CI: 0.91- 6.15). Macrosomic babies ($\geq 4\text{kg}$) were delivered by obese cases only.

Conclusions: Obese pregnant women are more prone to have obesity-related co-morbidities, higher incidences of caesarean section and fetal macrosomia.

Keywords: Maternal obesity, caesarean-section, macrosomia, obesity-related comorbidities, pregnancy.

آثار سمنة الحوامل على الحمل والولادة في مصراتة | ليبيا

مقدمة: السمنة هي وباء عالمي يؤدي إلى اعتلال كبير والوفاة المبكرة. وفي ليبيا، تضاعف انتشار السمنة لدى البالغين ثلاث مرات تقريباً خلال السنوات الثلاثين الماضية. سمنة الحوامل تتسبب في مشاكل محتملة خلال فترات ما قبل الولادة، واثناء الولادة، وبعد الولادة، ولها عواقب سلبية على المدى القصير والطويل على الجنين.

الهدف: تقدير معدل السمنة بين السيدات الحوامل في مستشفى مصراتة العام. تقييم العلاقة بين زيادة الوزن سمنة الحوامل وما تتسبب في مشاكل ومضاعفات اثناء الولادة، وبعد الولادة وعلى الجنين.

المنهجية: دراسة مقطعية، فترة شهرين، في مستشفى عام في مصراتة، ليبيا. ١٤٩ مريضاً قابلتهم الباحثة مرتين. المقابلة الأولى في جناح المخاض، والمقابلة الثانية، خلال أول ٢٤ ساعة بعد الولادة (مهبلية أو قيصرية). النساء المصنفات وفقاً (لمؤشر كتلة الجسم) إلى مجموعتين: المجموعة الأولى مع مؤشر كتلة الجسم أقل من ٢٥ (الوزن العادي)، والمجموعة الثانية مع مؤشر كتلة الجسم أكثر من ٢٥ (زيادة الوزن، والسمنة).

النتائج: وجدت السمنة وزيادة الوزن في ٩٩ حالة (٦٦,٥%). وكانت أكثر بالغة العمرية الأكبر سناً (متوسط العمر ٢٩). مع وجود تاريخ مرضي طبي أكثر (فقر الدم، مرض السكري الحلي، ارتفاع ضغط الدم اثناء الحمل)، وزيادة معدل العملية القيصرية (OR= 4.19, p-value= 0.04, 95% CI: 1.05- 15.34 OR= 2.44, p-value= 0.08, 95% CI: 0.91- 6.15), ووجود أمراض مصاحبة (بما في ذلك مرض السكري، ارتفاع ضغط الدم، فقر الدم، وارتفاع ضغط الدم اثناء الحمل) كانت أكثر في المشاركات السمنات مقارنة بالمشاركات غير السمنات (25.1% مقابل 3%). سمنة الحوامل تزيد من نسبة إجراء عملية قيصرية (OR= 3.02, p-value <0.00, 95% CI: 1.80- 5.74).

الخلاصة: النساء الحوامل مع مؤشر كتلة الجسم أعلى من ٢٥ (زيادة الوزن والسمنة) هم أكثر عرضة لتطوير مضاعفات طبية اثناء الحمل والولادة وكذلك ارتفاع معدل الإصابة بالعملية القيصرية وكبر وزن الجنين.

الكلمات الافتتاحية: الحمل، والسمنة، وزيادة الوزن، والعملية القيصرية، وكبر وزن الجنين، والأمراض المصاحبة للسمنة.

Introduction:

Obesity is a global epidemic resulting in major morbidity and premature death. Adult prevalence rates are the percentage of a country's population considered to be obese. In Libya the prevalence of adult obesity has more than tripled in the last 30 years, from a prevalence of 12.6% in 1984 to 41.9% in 2016.⁽¹⁾

Approximately 64% of Libyan adults are either overweight or obese, with twice as many women than men. Obesity causes significant morbidity and mortality; therefore, its prevention and treatment should be noted by the healthcare community, researchers and policy makers across Libya.⁽²⁾ In 2012, the direct treatment costs of obesity-related comorbidities in Libya were estimated at 1.3 billion Libyan Dinars per annum (approximately 638 million pounds), which constituted 50- 65% of Libya's total health care budget.⁽³⁾

In 2014, it was estimated there were 38.9 million overweight and obese pregnant women and 14.6 million obese pregnant women across the globe. In upper middle-income and lower middle-income countries, there were sharp increases in the numbers of overweight and obese pregnant women. Obesity causes issues in pregnancy during antepartum, intrapartum, postpartum and on offspring, and it has short term and long-term adverse consequences for both the mother and child. Obesity causes problems with fertility and in early gestation, it causes spontaneous pregnancy loss and congenital anomalies.⁽⁴⁾

Obesity related reproductive health complications range from infertility to a wide spectrum of diseases, such as hypertensive disorders, coagulopathies, metabolic dysregulation i.e. gestational diabetes mellitus, respiratory complications and fetal complications such as large for gestational age and shoulder dystocia.⁽⁵⁾⁽⁶⁾ The combination of obesity and associated decreased insulin sensitivity increases the long-term risk of individuals developing the metabolic syndrome and associated diabetes problems, hypertension, hyperlipidemia and cardiovascular disorders. Hence pregnancy is considered a metabolic stress test for the future risk of acquiring a metabolic syndrome.⁽⁷⁾

Objectives:

The aim of this study was to estimate the rate of obesity in pregnant women in Misurata public teaching hospital, and to evaluate associations between maternal obesity and maternal complications and perinatal macrosomia.

Methods And Participants

Study Design And Sampling:

A cross-sectional observational study was conducted using a sample of pregnant Libyan women attending a public teaching hospital in Misurata, in the middle region of Libya. Data collection was performed from January 2018- February 2018 (approximately two months). Participants attending the labor ward during the morning working hours were interviewed, first interview after admission to labor ward (in active labor) and interviewed again after delivery (vaginal or caesarean section) during the first 24 hours of the post-partum period. The researcher

explained the study objectives in the first interview and ensured confidentiality was paramount during the study.

Ethical Approval

Ethical approval was obtained from the Medical Research Office, Faculty of Medicine, Misurata Teaching Hospital, and approval by the Institutional Review Board. The study protocol was approved by the Ethical Committee of the institution. Informed consent was obtained from all participants prior to interview. The researcher explained the purpose of the study and ensured confidentiality.

Inclusion And Exclusion Criteria

Eligibility criteria included pregnant Libyan women in early spontaneous labor with singleton term pregnancy, who lived in Misurata and planned to have their current delivery at the public teaching hospital. Exclusion criteria included women who were preterm or post-term or had multiple pregnancies or abnormal presentations. Participants with histories of antepartum hemorrhage, including abruptio placentae or placenta previa, and cases of induced deliveries were also excluded. These cases could affect the mode of delivery. All eligible participants were invited to participate in the study.

Data Collection

Data collection was performed at the maternity ward five days per week: in the morning working hours, during the two-month period of the study. On data collection days, all eligible and available women in early labor were invited to participate. The researcher conducted interviews using a questionnaire which had the following questions: age, weight and height. At the time of admission, the body mass index (BMI) ($\text{kg} \cdot \text{m}^2$) was calculated by dividing the maternal weight in kilos by the height in square meters.⁽¹⁾ The second part of the questionnaire included current obstetric history: gravidity, data for the gestational period, the number of fetuses, presentation, and presence of co-morbidities during this pregnancy. Past obstetric history included: mode of deliveries (normal vaginal deliveries, previous history of cesarean sections), history of abortions.

Participants were divided into two groups. The first group (50 cases) consisted of participants with normal BMIs of 25 and less. The second group (99 cases) consisted of participants with BMIs of more than 25 (overweight and obese). Participants were interviewed for the second time during the first 24 hours after delivery, to report: the pregnancy outcome, mode of delivery (normal vaginal delivery or by caesarean section), baby weight, and occurrence of any complications i.e. postpartum hemorrhage.

Statistical Analyses:

Data statistical analysis was performed using Stata 14.1 software. Continuous variables were represented as the mean and standard deviation (SD). Categorical data were represented by frequency with percentage and were analyzed by the chi-square test. Multivariate analysis was performed using logistic regression. We used the odds ratio (OR) with a corresponding 95% confident interval (CI).

Results:

☐ Descriptive analysis; distribution of cases according to BMI: The study

sample included 149 pregnant women, at full term pregnancy or early in labor. Ninety- nine participants (66.4%) were classified as overweight\ obese [overweight (24.8%), and obese level I& level II (41.6%)], Table (1).

Table (1) Classification of patients according to BMI (kg\ m²)

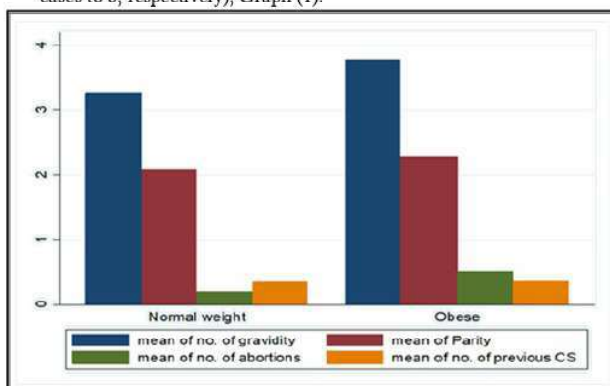
Body Mass Index	No. Of Patients	Frequency%
Normal BMI (18- 25)	50	33.6
Overweight (26- 30)	37	24.8
Obesity I (31- 35)	37	24.8
Obesity II(>35)	25	16.8
Total	149	100

The average age of obese women was 29 (±6.56 years), and for normal weight, it was 26 (±5.45 years). Obese women were more in older age groups, (41- 45) years old there were only five obese patients in this age group Table (2).

Table (2) Obesity and age groups

Age	Normal Weight No.= 50	Frequency%	Obese No.=99	Frequency%
Average Age (Sd)	26 (±5.45 years)	33.5%	29 (±6.56 years)	66.5%
Age Group	16- 20	9	13	13.1
	21- 25	17	23	23.2
	26- 30	16	28	28.3
	31- 35	6	18	18.2
	36- 40	2	13	13.1
	41- 45	0	5	5.1
Total	50	100	99	100

□ Past obstetric history in relation to body weight: The mean values for gravidity, parity, abortions and previous cesarean sections are all higher in the obese group, e. g. five obese patients had more than eight pregnancies while normal weight patients had less gravidity. Also, obese patients nearly triple times history of abortions than normal weight patients (29 abortions versus 10, respectively). Regarding the history of previous cesarean sections, obese patients had more than double the number of normal weight patients with previous CS (20 cases to 8, respectively), Graph (1):



Graph (1) Obstetric history in relation to body weight

Bivariate analysis for factors associated with obesity There was a significant statistical relationship (p- value<0.00) between obesity and the medical histories of participants (co- morbidities). Thirty- five participants were classified as obese, had obesity related co- morbidities, while only seven patients with normal weight had co-

morbidities (P- value< 0.00). During current pregnancy, we observed a statistically significant difference (P- value<0.01) between obesity and the normal weight group, in terms of mode of delivery. 28 participants in the obese group gave birth via cesarean section, while five participants at normal weight had a cesarean section. When we categorized the mode of delivery as vaginal delivery, induction of labor (IOL), elective cesarean section and emergency cesarean section, we found significant statistical differences (P- value< 0.10) between participants in the obese group and the normal weight group Table (3).

Table (3) Maternal weight in relation to medical history and mode of delivery

Categories		Normal Weight	Obese	P- value (Chi ² Fisher exact test)
Co- Morbidities	No CoMorbidities	43	64	0.00***
	Co- Morbidities	7	35	
Mode Of Delivery	Vaginal Delivery	45	71	0.01**
	Caesarean	5	28	
Categories Of Delivery	Vaginal Delivery	39	56	0.05*
	IOL	6	15	
	Elective CS	3	14	
	Emergency CS	2	14	

***Significant at 1%, **Significant at 5%, *Significant at 10%

Multivariate Analysis:

A logistic model was used to investigate if obesity and other factors affected the probability of having a cesarean section. The dependent variable was the mode of delivery, which was 0 if it was a vaginal delivery and 1 if it was a cesarean section. The independent variables were: obese which was 1, and 0 otherwise. Number of gravidities shows the total number of pregnancies, number of abortions represents how many abortions a patient had before, number of previous cesarean section shows how many previous cesarean sections a patient had. Obesity- related co- morbidities (diabetes mellitus, hypertension and anemia) is a dummy variable which equals 1 if the participant had any co- morbidities. In this model, three factors were associated with caesarean section: obesity (OR= 4.19, P- value= 0.04, 95% CI: 1.08- 16.15); the history of a previous caesarean Section (OR= 3.02, P- value< 0.00, 95% CI: 1.70- 5.37); and having obesity- related co- morbidities (OR= 2.36, P- value= 0.08, 95% CI: 0.91- 6.15). The obese participants were four times more likely to have a cesarean section than participants with normal weight. In other words, obese participants were 300% more likely to have a cesarean section. Also, a history of a previous cesarean section increased the odds of being admitted to cesarean section by three times. A participant with obesity- related co- morbidities was 136% more likely to have a cesarean section Table (4).

Table (4) Mode of delivery in relation to medical and obstetric histories

Mode Of Delivery	Odds Ratio	Std. Err.	z	P>Z	[95% Conf. Interval]	
Obese	4.19**	2.88	2.08	0.04	1.08	16.15
No. Of Gravidity	1.02	0.12	0.17	0.87	0.80	1.29
No. Of Abortions	1.37	0.47	0.93	0.35	0.70	2.68
No Of Previous Cs	3.02***	0.88	3.78	0.00	1.70	5.37
Co- Morbidities	2.36*	1.15	1.76	0.08	0.91	6.15
Constant	0.03***	0.02	- 4.58	0.00	0.01	0.15

***Significant at 1%, **Significant at 5%, *Significant at 10%

- ⊠ Complications: Obesity is associated with issues during antepartum, intrapartum and postpartum periods. In terms of antepartum complications co- morbidities were found more in obese pregnant ladies. Iron deficiency anemia was three times more than in non-obese participants (21.2% versus 6%). Essential hypertension, pregnancy induced hypertension (PIH), diabetes mellitus type 2, gestational diabetes mellitus (GDM), all were present only in obese pregnant ladies (100%). Regarding postpartum complications: postpartum hemorrhage occurred only in one obese lady Table (5).

Table (5) Antepartum and postpartum Complications in relation to maternal weight

Complications		Normal Weight	Frequency	Obese	Frequency	Total
Medical History	Anaemia	3	6%	21	21.2%	24
Hpt:	Essential HPT	0	0%	3	100%	3
	Pregnancy Induced Hpt	0	0%	6	100%	6
Diabetes:	Type 2	0	0%	3	100%	3
	Gestational Diabetes Mellitus	0	0%	2	100%	2
Postpartum Complication	Postpartum Haemorrhage	0	0%	1	100%	1

In terms of intrapartum complications i.e. emergency caesarean sections and big babies increased with increases in BMI, the highest rate of emergency caesarean section was in obese patients with BMI > 35.

The number of macrosomic babies progressively increased with the increase in maternal BMI, nearly quarter of obese participants with more than 35 BMI had macrosomic babies.

Normal vaginal deliveries were highest in overweight participants and lowest in the obese, it decreased with the increase in BMI Table (6).

Table (6) Intrapartum Complications in relation to degree of obesity

Obesity BMI	No. Of Patients	Big Size Baby%	Vaginal Delivery%	Elective CS%	Emergency CS%
25- 30	37	2	30	4	3
		5%	81%	10.8%	8.1%
31- 35	37	6	25	7	5
		16.2%	67.5%	18.9%	13.5%
>35	25	6	16	3	6
		24%	64%	12%	24%
Total	99	14	56	14	14
	100%	14.15%	56.5%	14.15%	14.15%

In this study, we estimated the rate of maternal obesity and overweight, among Libyan women in early labor, who were attending the public hospital in Misurata, Libya, it was 66.3%, which is similar to published data, stating that approximately 75.3% of Libyan adults were overweight and obese.⁽⁸⁾ In Africa, the increase in female obesity has been steeper than for Asian females with more than 40% of reproductive females being overweight or obese. Approximately one in four maternal deaths result from pre- existing medical conditions, including obesity and diabetes.⁽⁹⁾

According to our study, obesity was more common amongst older and multiparous women. A study from the north east of England found

that women classified as obese at antenatal booking were significantly older, more parous and lived in more deprived areas, when compared to women whose weight was classified in the healthy BMI range.⁽¹⁰⁾

In this study, comorbidities, including gestational diabetes (GDM), preeclampsia (PET), anemia, were reported in obese pregnant women, than in normal weight pregnant women. A similar study from the United Kingdom showed that women with a BMI ≥ 30 were more likely to develop GDM, than women with a BMI of 20.0- 24.9.⁽¹¹⁾ These findings were also similar to an Australian study, which showed that the odds of developing gestational diabetes were 2.95 times higher in obese women (BMI 30.0- 40.0) when compared with normal-weight (BMI 20.0- 25.0) women. The same study also showed that the prevalence of pregnancy- induced hypertension/PET was four times greater in obese women than in women of normal weight.⁽¹²⁾

During labor and delivery, our study showed that obesity was associated with a higher incidence of intrapartum complications, leading to higher rates of emergency caesarean sections for obese women, when compared with women with normal BMIs. Many studies have reported positive associations between maternal BMI or weight and caesarean sections, including a meta- analysis of 33 cohort studies calculated that the risk of a caesarean sections was approximately two and three times higher for obese and severely obese women, respectively, when compared with pregnant women in the normal weight range.⁽¹³⁾

In our study, obesity was associated with increases in gravidity, parity, abortion and caesarean sections (emergency and elective). Regarding the rate of emergency caesarean sections, it increased with the increase in the body mass index (BMI), (the rate of emergency caesarean sections was lowest in overweight pregnant women increases in obesity grade I, and highest rate was in obesity grade II). The rate of elective caesarean sections in our study also increased in participants with a previous history of caesarean section and in participants with comorbidities including gestational hypertension, macrosomia and gestational diabetes. These observations were consistent with other studies performed in other Arabic countries including Oman and Iraq.⁽¹⁴⁾⁽¹⁵⁾

Obese women had an increased risk of postpartum hemorrhage, a study in Sweden showed that the risk of atonic uterine hemorrhage increased rapidly with increasing BMI.⁽¹⁶⁾ This was consistent with an Australian study which stated that obesity is an important high- risk factor for PPH. These authors recommended that in addition to the standard practice of active management of the third stage of labor, there should be increased vigilance and preparations for PPH management in obese women.⁽¹⁷⁾ In our study, we observed only one case of primary postpartum bleeding (within 24 hours after delivery) which occurred in an obese woman due to an atonic uterus. A blood transfusion was therefore performed.

In our study, maternal obesity is associated with an increased risk of

fetal macrosomia. We investigated the relationship between obesity and complications during labor and found that big babies (body weight of more than 4 kg) were delivered to obese women. There are many reports stating that birth weights of neonates are significantly higher in obese groups. Results from a meta- analysis conducted in Canada, provided convincing evidence of the positive relationship between maternal obesity and fetal overgrowth, and further stated that associations between maternal obesity and fetal overgrowth may well represent the first opportunity these obese mothers can modify the intergenerational obesity cycle.⁽¹⁸⁾⁽¹⁹⁾⁽²⁰⁾⁽²¹⁾

Study Limitations:

Our study was observational. It reported the prevalence of obesity rates in a maternity population in Misurata city, Libya. There should be more prevalence studies of maternal obesity conducted across Libya. A study is needed to explore the causes of obesity, which may help prevent obesity during the reproductive years. There should be multi- disciplinary care for obese pregnant women, including obstetricians, dietitians, physicians and nutritionists to follow- up these women to prevent and treat early obesity complications.

Conclusion And Recommendations:

Obesity during the reproductive period is a worldwide public health problem. In Libya, maternal and fetal short term and long- term complications greatly affect health resources which are exhausted thanks to political instability. The optimization of pre- pregnancy weight is an ideal approach; individuals and public health measures should be in place to encourage women to have normal body weights prior to pregnancy. Deciding risk factors for obesity and developing programs to prevent and treat obesity during reproductive periods, counselling patients about the health hazards of obesity and encouraging weight reduction before pregnancy, can improve health and pave the way for healthier pregnancies. The following steps can help prevent complications during pregnancy; tailoring weight gain during pregnancy according to published guidelines, careful management of weight, attention to diet and exercise and regular prenatal care to monitor weight gain during pregnancy.

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✧ Conflict of Interests: The authors declare no conflict of interests regarding the publication of this paper.

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