Effect of maternal body mass index on Labour Prognosis in Nulliparous Women

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Abstract: Maternal obesity is associated with an increased risk of structural fetal abnormalities. Moreover, pregnancy outcomes deteriorate in a linear manner as BMI increases from "normal" to obese. The list of complications during pregnancy for overweight and obese women is substantial, including heightened risk of gestational diabetes, hypertensive disorders, blood clots, infections and preterm delivery. Many of these conditions create further risks and complications. For example, diabetes during pregnancy increases the likelihood of pre-eclampsia, pre-term birth, caesarean section and postoperative infections. In the case of hypertension, pregnant women with high BMIs are also more likely to experience more severe forms of hypertensive complications. Many pregnancy-related complications require that women undergo an increased level of maternal and fetal monitoring and given their weight there is the potential for poor ultrasound visualization of the baby and consequent difficulties in fetal surveillance and screening for anomalies. This study, like any other observational study of its kind suffers from several limitations. firstly, the ideal time to record the baseline height and weight of a pregnant woman is before she has started gaining weight due to gestation taking into consideration that pre-pregnancy weight was known from the patients own words and history taking. Secondly, our study used data collected over 6 months; a short duration which should be extended in later studies and researches to show the longstanding impact of obesity on the patient. The third limitation was the lack of standard definitions of overweight and obesity which makes comparison of findings across studies difficult.
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1. Introduction

Obesity has been recognized by WHO as "a pandemic nutritional disorder which represents a rapidly growing threat to the health of populations of an increasing number of countries world- wide. Maternal obesity has significant health implications, contributing to increased morbidity and mortality for both mother and baby, higher proportion of women who die in pregnancy/postpartum are obese**.** Obesity is a condition in which excess body fat has accumulated to an extent that health may be negatively affected. Obesity is commonly defined as a body mass index (BMI) of 30 kg/m^2 or higher. Obesity, in absolute terms, is an increase of body adipose (fat tissue) mass and, in a practical setting, this is difficult to be determined directly. Therefore, the common clinical methods used to estimate obesity are by body mass index (BMI) and in terms of its distribution via the waist hip ratio. Adults with BMI (calculated as weight in kg. divided by height in meters squared) between 25-30kg/m^2 are considered overweight and those with BMI $\geq$ 30 are considered obese**.** The prevalence of obesity has risen such that it is now a worldwide epidemic**.**

As obesity increases, so does the number of women of reproductive age who are overweight and obese. This is having deleterious effects on female reproduction in general and a major impact on maternity services. Antenatally, obesity increases the risk of miscarriage, gestational diabetes mellitus (GDM), gestational hypertension, thrombo embolism, and pre-eclampsia. As gestation progresses beyond term, perinatal morbidity and mortality increase as well as maternal complications such as pre-eclampsia, postpartum haemorrhage and caesarean delivery**.** Women with high body mass index (BMI) and prolonged pregnancy are therefore becoming an increasingly prevalent clinical problem.

Management of prolonged pregnancies in obese women, however, is difficult because induction of labour is associated with a high risk of caesarean section and its attendant complications of infection, haemorrhage and thrombosis whereas conservative management is associated with an increased risk of perinatal mortality. The clinician managing an obese woman with a prolonged pregnancy therefore faces the dilemma of whether to; induce her and risk caesarean section delivery and its complications, which can include maternal death, to book an elective caesarean section and thereby reduce the increased risks associated with emergency caesarean section, or to wait so as to maximize the chance of spontaneous

labour, thereby reducing the risk of caesarean section but increasing the risk of fetal death, even with outpatient monitoring. There are few published data that inform the clinician and their patients as to the prevalence of complications with each of these options**.**

Obesity is also associated with a higher risk of adverse neonatal outcomes, including stillbirth, congenital anomalies, neonatal intensive care admission, and neonatal death.

Post-natally, obese women are less likely to breastfeed successfully, have a longer postnatal stay in hospital, and are at risk of postnatal infections.

In the meantime we need not give up hope, because some obese patients with the proper counseling can achieve meaningful weight loss before conception**.** Hendler et al, suggest that all pregnancies in obese women be acknowledged as high risk and managed according to strict guidelines. Management should include pre-pregnancy counseling to reduce weight; shared antenatal care and appropriate management of complications. The evidence for obesity as an important complication in pregnancy is mounting; it is time to inform practice based on this evidence**.**

2. Patients and methods

Study setting:

This study was carried out in the department of Obstetrics and Gynecology, Shibin Elqnatar public hospital**.**

Type of the study: This is a cross sectional study on effect of maternal body mass index on labour prognosis in nulliparous women and compares the outcome in obese, overweight, and normal weight pregnant women.

Patients and methods:

300 pregnant women were included in the study fulfilling the following inclusion and exclusion criteria:-

Inclusion criteria:

- Singleton deliveries.
- Patients coming in active labour with cervix more than 2 cm.
- Patients with no medical disorders as Diabetes or Hypertension.

Exclusion criteria:

- Multiparas.
- Women with multiple pregnancies.
- Women with pre- gestational diabetes or hypertension.
- Women with associated medical complications (As endocrinal, cardiac, renal, and others).
- Patients admitted for elective C.S.
- Major fetal anomalies.
- Intrauterine growth restriction.
- All inductions of labor.

They were divided into 3 groups based on their body mass index (BMI):-

Group (A): include the pregnant women with a BMI between 18,5-24,9kg/m^2 (normal weight).

Group (B): include the pregnant women with a BMI between 25-29.9kg/m^2 (overweight).

Group (C): include the pregnant women with a BMI $\geq$ 30 kg /m^2 (obese).

Patients included in this study were subjected to:

I- Verbal consent was obtained from the pregnant women who are included in the study.

II- Full History Taking Including:

- Name, age, occupation and address.
- Obstetric history and 1st day of last menstrual period (LMP), early scan and gestational age documentation.
- Medical or operative history.
- Any drug allergy or obstetric or operative complication.

III- Clinical Examination:

General examination:

- Vital signs: blood pressure, pulse, respiratory rate and temperature.
- Height (in cm) and weight (in kg) measurements while subjects were wearing the possible lightest clothing. and body mass index (BMI) was calculated at time of admission by using the Formula:

$$\frac{\textbf{Weight in (kg)}}{\textbf{Height in (meters)}^2}$$

Taking into consideration the pre-pregnancy weight which was known either through her weight previously documented in her follow up card or from the patient's own words.

- Head and neck examination for jaundice, pallor, pigmentations, edema, goiter, enlarged lymph nodes and congested neck veins.
- Limb examination for edema, varicose veins, and deformities.

Abdominal examination:

- **Inspection**: to detect size of the abdomen, Striaegravidarum and pigmentations as lineanigra.
- **Obstetric palpation(Maneuvers of Leopold):**
  - Fundal level.
  - Fundal grip to detect the part of the fetus occupying the fundus.
  - Umbilical grip to detect the back and fetal limbs.
  - First pelvic grip to detect part of the fetus occupying the lower uterine segment and to detect engagement.

P.V examination (under aseptic precautions):

-Assessment of pelvic capacity.
- Dilatation and effacement of the cervix.
- Exclusion of cord presentation and prolapse.
-State of membranes (intact or ruptured).
- Detection of meconium staining of amniotic fluid after rupture of membranes.
-Presentation, position and engagement.
-Degree of deflexion.

IV- Laboratory Investigations:

- HB%
- RBS.
- Urine analysis.

V- Ultrasound:

- To asses number of fetuses, presentation, gestational age, estimated fetal weight and position of the placenta.

Outcome measures:

- Delivery outcomes including; onset of delivery, mode of delivery, reason for delivery mode, labour length (first, second, third stage), estimated blood loss, and the extent of perineal tear.
- Neonatal outcomes including: birth weight, Apgar score at 1 and 5 minutes after delivery and incidence of shoulder dystopia and stillbirth. The purpose of this study.
- was to evaluate the effect of maternal body mass index on labour prognosis in nulliparous women.

3. Results

A total of 300 women participated in the study, whose age ranged between 20-40 years 75%of our cases were under 30 years old and 25% were over 30 years old. All patients are primigravidas (100%). These patients were divided into 2 groups:

(1) Group I / 150 pregnant women with normal weight (BMI = 18.5 – 24.9 kg/m^2).

(2) Group II / IIA 75 pregnant women who are overweight (BMI = 25 – 29.9 kg/m^2) and IIB 75 pregnant women who are obese (BMI >= 30 kg/m^2).

Table 1: Incidence of Intra uterine growth restriction.

IUGR						Chi-square
		Group I	Group II	Group III	Total	
Negative	N	147	63	69	279	P-value
	%	98.00	84.00	92.00		
Positive	N	3	12	6	21	<0.001*
	%	2.00	16.00	8.00	7.00	
Total	N	150	75	75	300	
	%	100.00	100.00	100.00	100.00	

Table 2: Incidence of c.s.

DELIVERY		Groups				
		Group I	Group II	Group III	Total	Chi-square
C.S.	N	27	27	30	84	P-value
	%	18.00	36.00	40.00	28.00	
N.V	N	123	48	45	216	<0.001*
	%	82.00	64.00	60.00	72.00	
Total	N	150	75	75	300	
	%	100.00	100.00	100.00	100.00	

Table 3: Neonatal blood glucose at birth in obese/ overweight and normal weight women (gm/dl).

	Neonatal blood glucose					ANOVA
	Range			Mean ±	SD	P-value
Group I	30	-	105	90.340 ±	25.188	0.03*
Group II	25	-	119	82.560 ±	34.978	
Group III	25	-	117	79.080 ±	40.245	

Table 4: Neonatal body weight at birth in obese/ overweight and normal weight women (Kg).

	Baby wt					ANOVA
	Range			Mean ±	SD	P-value
Group I	3000	-	4600	3281.600 ±	318.872	0.001*
Group II	3100	-	5400	3556.600 ±	789.655	
Group III	3110	-	5100	3360.600 ±	552.878	

4. Discussion

Obesity has become an epidemic throughout the world. Worldwide, obesity rates have doubled in the last 30 years, with rates also increasing among pregnant women.

Maternal obesity has significant health implications, contributing to increased morbidity and mortality for both mother and baby, a higher proportion of women who die in pregnancy/postpartum are obese. As obesity increases, so does the number of women of reproductive age who are overweight and obese. This is having deleterious effects on female reproduction in general and a major impact on maternity services antenatally; obesity increases the risk of miscarriage, gestational diabetes mellitus (GDM), gestational hypertension, thrombo embolism, and pre-eclampsia.

As gestation progresses beyond term, perinatal morbidity and mortality increase as well as maternal complications such as pre-eclampsia, postpartum haemorrhage and caesarean delivery. Women with high body mass index (BMI) and prolonged pregnancy are therefore becoming an increasingly prevalent clinical problem. Management of prolonged pregnancies in obese women, however, is difficult because IOL is associated with a high risk of caesarean section and its attendant complications of infection, haemorrhage and thrombosis whereas conservative management is associated with an increased risk of perinatal mortality. The clinician managing an obese woman with a prolonged pregnancy therefore faces the dilemma of whether to; induce her and risk caesarean section delivery and its complications, which can include maternal death, to book an elective caesarean section and thereby reduce the increased risks associated with emergency caesarean section, or to wait so as to maximize the chance of spontaneous labour, thereby reducing the risk of caesarean section but increasing the risk of fetal death, even with outpatient monitoring. There are few published data that inform the clinician and their patients as to the prevalence of complications with each of these option**s.** Obesity is also associated with a higher risk of adverse neonatal outcomes, including stillbirth, congenital anomalies, neonatal intensive care admission, and neonatal death). Post-natally, obese women are less likely to breastfeed successfully, have a longer postnatal stay in hospital, and are at risk of postnatal infections. This study adds to the increasing body of evidence which suggests that obesity, measured by BMI, predisposes women to complicated pregnancies and increased obstetric interventions. We discussed the relationship between increasing body mass index and the risk of developing gestational hypertension, gestational diabetes, macrosomia, IUGR, emergency cesarean section.

In our research IUGR affected 7% of our 300 women, 18cases in the obese/ overweight group were found (12%) and only 3 (2%) in the normal weight group (statistically significant)**.**

With regard to Cedergren intrauterine growth retardation measured by the fetal birth weight the risk of low birth weight (birth weight less than 2,500 g) was lower in obese women, while macrosomia (birth weight more than 4,000g) was much more common in the obese.

Our study showed statistical significance in risk of developing low birth weight fetuses in obese group compared to normal weight group although 9 patients in obese group were having low birth weight fetuses compared to 4 patients in normal weight group.

Other several studies agree with our study. Several studies investigating the relationship of maternal obesity with fetal growth have shown that obese women have an 18 – 26% increased chance of delivering large for date infants, even after controlling maternal diabetes A large population based cohort study of Swedish women was done and found that the risk of delivering a small for gestational age baby decreased with increasing BMI among parous women.

The study of Cedergren also supports this; however after excluding a woman with pre – eclampsia, this increased risk was no longer statistically significant.

Reported significant increase in neonatal fat mass in birth weights of infants born to women with gestational diabetes mellitus. The strongest predictor of fat mass in infants of women with gestational diabetes mellitus was found to be maternal fasting glucose levels (25-40%). This neonatal obesity is proposed to be a significant risk factor for adolescent/adult obesity**.**

In our study a total of 28% of women performed a cesarean section. Women with BMI 18.5-24.9 kg\m^2 performed less C.S (18%), whereas the obese/ overweight group had almost 2 times the incidence of the normal group (38%). Although many cases performed cesarean sections, the results were statistically significant. In contrast to the increased incidence of cesarean section performed in obese/ overweight women.

In other study maternal obesity is an independent risk factor for cesarean sections. Investigated pregnancy outcome of obese patients not suffering from hypertensive disorders or diabetes mellitus, we found that the association between obesity and cesarean section remained significant after controlling for variables recognized to co-exist with obesity. Also with a prospective observational Cohort study of 4341 women at High Wycombe General Hospital, London

done by Bergholt reported that the incidence of cesarean section delivery increase significantly with an increased BMI, women with BMI >35 kg/m^2 had 3,8 times greater chance of caesarean section delivery than women with BMI <25 kg/m^2**.**

Another study similarly showed that the cesarean section rate for obese women was over 20% compared to nearer 10% for normal-weight women. In this study 57.5% in obese group performed a cesarean section compared to 25% in the normal weight group**.** The principal aim of this study was to examine pregnancy outcomes in obese women. Our study found increased risk of several complications in obese women; like gestational hypertension, gestational diabetes, cesarean sections rates, and macrosomia. Despite restricting this study to nulliparous women delivering singleton babies we achieved a sample size of 300 women.

Conclusion

Maternal obesity carries significant risks for the mother and fetus.

1. The primary objective in the management of obesity during pregnancy is prevention.
2. Obesity has hazardous risks on pregnancy:

a. In early gestation, the risks of spontaneous abortion and congenital anomalies.

b. In later gestation, gestational hypertension and diabetes-related problems, macrosomia.

c. At parturition, the increased risk of cesarean delivery and attendant complications of anesthesia, wound disruption, infection, and deep vein thrombosis.

3. For obese women, exercise may help to reduce the risk of gestational diabetes mellitus.
4. Prevention rather than treatment may offer the best hope of breaking the vicious cycle of obesity during pregnancy.

Study limitation

In our study we have relied on height and weight recorded in early pregnancy, before any real impact of gestational weight gain. Still, values recorded in early pregnancy remain an approximation of the pre-pregnancy weight, and therefore subject to bias.

Secondly, our study used data collected over 10 months; a short duration which should be extended in later studies and researches to show the longstanding impact of obesity on the patient.

The third limitation was the lack of standard definitions of overweight and obesity which makes comparison of findings across studies difficult. While most reports define obesity as an increased body mass index of greater than or equal to 30 Kg/m^2 (IOM), others have defined it as increased waist circumference, increased waist – hip ratio or body weight of more than 90 Kg. This makes comparison of studies difficult and may have implications in the management of normal pregnancy, as in the United States, recommended gestational weight gain is dependent on women's pre-pregnancy BMI categories.

Moreover, in most clinics, pre-pregnancy BMI is not recorded routinely, thereby making extrapolation of booking weight or women's recall of pre-pregnancy weight unreliable.

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