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First Trimester Body Mass Index and Adverse Pregnancy Outcomes

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Abstract

Background: Overweight or obese women at the start of pregnancy are at increased risk of hypertensive disorders of pregnancy, gestational diabetes and delivery complications such as prolonged delivery and higher rates of cesarean sections. On the other hand, maternal underweight is associated with many maternal and fetal consequences which are mainly attributed to the poor nutritional status of the affected mothers.

Aim of Study: The study's goal is to investigate how BMI affects pregnancy outcomes.

Patients and Methods: In the current study, it was found that women with morbid obesity had significantly higher frequency of preeclampsia, CS, meconium present in liquor,perineal tears and manual removal of placenta when compared with women other groups. In addition, underweight women had significantly higher frequency of preterm labor.

As regard BMI and neonatal outcome, the study found that neonates born to morbidly obese women had significantly higher frequency of LGA while those born to underweight women had significantly higher frequency of SGA.

Results: Weight (KG) divided by the square of height was used to determine the body mass index (BMI). BMI was used to categorize women as underweight (BMI 19.8Kg/m^2) normal weight (BMI 19.9-24.9Kg/m^2), overweight women (BMI 25-29.9Kg/m^2), obese (BMI 30-39.9Kg/m^2), and morbid obese (BMI 40Kg/m^2)

Conclusions: Obese women experienced pregnancy and neonatal problems far more frequently.SGA and poor Apgar scores were substantially more common in underweight women.

Key Words: *First trimester body mass index – Adverse pregnancy outcomes.*

Introduction

THE success of a pregnancy is an important issue that is influenced by factors including time of delivery and birth weight; up to 10% of pregnancies were said to have premature membrane rupture, preterm delivery, and low birth weight. According to reports, attentive prenatal treatment may reduce these difficulties and other life-threatening variables. It would also undoubtedly stop severe permanent neonatal complications, as well as unnecessary costs for society. The primary maternal BMI and weight gain during pregnancy are the most significant of these variables **[1,2]**.

It was suggested that the pre-pregnancy BMI should be used to determine how much weight women gain during pregnancy. Women with a BMI of 25-29.9Kg/m^2 should expect to gain 15-25 lbs., while those with a BMI 30 should gain a least 15 lbs **[3]**.

A high BMI during pregnancy is linked to poor obstetric outcomes. Early miscarriage, pregnancy-related hypertension, infections, protracted labour, and an increased risk of interventions like labour induction, surgical delivery, shoulder dystocia, and postpartum hemorrhage are all examples of maternal difficulties. Birth defects (mostly neural tube defects), macrosomia, intrauterine growth restriction, stillbirths, preterm birth, and the requirement for intensive care hospitalization are examples of perinatal problems **[4]**.

One of the best indicators of a poor pregnancy outcome is a low pregnant BMI. A low BMI is seen as a sign of insufficient nutrition stores in the tissues. While some researches have discovered an increased frequency of preterm delivery, low birth weight, and higher perinatal loss in these women, the impact of maternal underweight on obstetric performance is less evident **[5]**.

Patients and Methods

This study was a prospective observational study, conducted at Gynecology and Obstetrical Department, outpatient clinic at Zagazig University Hospitals in the period between January 2021 to April 2022. The study involved 100 pregnant wom-

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en attending outpatient clinic, after obtaining written informed consent. Patients were selected on the basis of the following criteria:

- *Inclusion criteria:* Singleton pregnancy, follow-up from first trimester.
- *Exclusion criteria:* Multiple pregnancy, Antepartum hemorrhage.

Operational design: The selected women were subjected to the following:

1- Written informed consent.

2- History: Personal, obstetrical, menstrual, medical, surgical, and family history.

3- Examinations: General examination: Weight, height, BMI, blood pressure, random blood glucose to exclude DM, cardiac consultation to exclude any cardiac disease.... etc. Abdominal examination: To assess abdominal contour, scar of any operation, repeated cesarean sections... etc.

4- Investigations: Ultrasound (pelvi-abdominal U/S) with each antenatal care visit (ANC) to confirm pregnancy and determine gestational age, detect fetal heart rate, multiple pregnancy, fetal weight and growth.Urine analysis throughout: 1 st trimester (up to 12 weeks) pregnancy test, detect infection; 2nd trimester (13-27 weeks) for glucose and/or protein; 3rd trimester (28 weeks to delivery) for glucose and protein, detection of bacteruria. Fetal Doppler U/S for assessment of fetal growth and well-being in the third trimester in high-risk pregnancy (DM, HTN) and pregnancy related conditions (suspected IUGR, decrease fetal movement, oligohydramnios, polyhydramnios). Complete blood picture throughout 1 st, 2nd and 3rd trimester. Patients were followed at ANC clinic according to WHO antenatal care visits from first trimester till the time of delivery then patients delivered whether vaginally or by cesarean section.

5- Measurement of weight, height, and BMI of each case: Body mass indices calculated at their first antenatal visit and patient classified according to their BMI to; Group (1): Underweight (<19.8 Kg/m^2), Group (2): Normal (19.9-24.9Kg/m^2), Group (3): Overweight (25-29.9Kg/m^2), Group (4):Obese (30-39.9Kg/m^2) and Group (5): Morbidly obese (40Kg/m^2)

6- Registration of data: Complications during pregnancy as gestational diabetes, gestational hypertension, PROM, polyhydramnios, anencephaly, preterm labor, breech presentation or antepartum hemorrhage; Complications during labor as failure of progress (prolonged 1 st stage of labor), fetal distress or difficult extraction of baby (shoulder dystocia); fetal weight (kg) by U/S at each ANC visit; Mode of delivery (V. Dor C.S); Apgar score at 1 and 5 minutes.

Results

No statistically significant differences between the studied groups regarding the clinical data (Table 1). Women with morbid obesity (Group 5) had significantly higher frequency of preeclampsia when compared with the women of other groups. No statistically significant differences were found between the studied groups regarding the rate of miscarriage. Women in group 1 (underweight) had significantly higher frequency of preterm labor. No statistically significant differences were noted between the studied groups regarding IUGR, IUFD and antepartum hemorrhage. No statistically significant differences between the studied groups regarding the clinical data (Table 2). Women in group 5 (morbidly obese) had significantly higher frequency of C.S when compared with other groups (Table 3). Morbidly obese women had significantly higher frequency of perineal tears, fetal distress and manual removal of the placenta (Table 4). Neonates born to morbidly obese women had significantly higher frequency of LGA while those born to underweight women had significantly higher frequency of SGA. In spite of the fact that women in underweight and morbidly obese groups had higher frequency of neonates with low Apgar scores and ICU admission, the difference is not statistically significant. (Table 5).

Table (1): Comparison between the studied groups regarding the clinical data.

	Group 1 n=20	Group 2 n=20	Group 3 n=20	Group 4 n=20	Group 5 n=20	*p*-value
BMI (Mean ± SD)	34.0±3.6	32.7±4.1	31.9±3.4	32.2±3.9	33.7±3.9	0.35
Gravidity	3.3±0.97	3.2±1.1	3.7±1.0	3.4±1.1	3.7±1.0	0.47
Parity	2.1±0.9	2.2±1.1	2.6±1.0	2.3±1.2	2.6±0.9	0.48

Group 1 (Underweight). Group 2 (Normal). Group 3 (Overweight). Group 4 (Obese). Group 5 (Morbid Obese).

Table (2):Comparison between the studied groups regarding the pregnancy complications.

	Group 1 n=20	Group 2 n=20	Group 3 n=20	Group 4 n=20	Group 5 n=20	*p*-value
Preeclampsia	–	–	–	1	3	0.015*
Abortion	3	1	2	2	3	0.84
Preterm labor	4	–	–	1	1	0.048*
IUGR	–	–	–	–	1	0.4
IUFD	–	–	–	–	–	–
Antepartum hemorrhage	–	–	1	–	–	0.4

Table (3): Comparison between the studied groups regarding the mode of delivery.

	Group 1 n=20	Group 2 n=20	Group 3 n=20	Group 4 n=20	Group 5 n=20	*p*-value
Vaginal delivery	17	18	17	16	10	0.017*
Cesarean section	3	2	3	4	10	

Table (4): Comparison between the studied groups regarding the intrapartum complications.

	Group 1 n=20	Group 2 n=20	Group 3 n=20	Group 4 n=20	Group 5 n=20	*p*-value
Perineal tears	1	–	–	1	4	0.048*
Fetal distress	1	–	–	1	4	0.048*
Manual removal of placenta	-	–	–	–	3	0.015*

Table (5): Comparison between the studied groups regarding the neonatal outcome.

	Group 1 n=20	Group 2 n=20	Group 3 n=20	Group 4 n=20	Group 5 n=20	*p*-value
LGA				1	4	0.013*
SGA	5	1	1	1	–	0.035*
Low Apgar score	4	1	1	1	4	0.24
Neonatal ICU admission	2	–	–	–	3	0.077

LGA: Large for gestational age, weight 90th percentile. SGA: Small for gestational age, weight 10th percentile.

Discussion

Overweight and obesity are becoming more common in obstetric communities all over the world. Pregnant women who are overweight or obese are more likely to develop gestational diabetes, hypertensive disorders of pregnancy, and delivery difficulties such extended labour and greater rates of caesarean sections [6]. After adjusting for publication bias, it has also been said that obese and overweight women had higher odds of giving birth to preterm babies. Additionally, research has shown a significant correlation between pre-pregnancy BMI and infant birth weight [7]. In addition to the known hazards of being overweight or obese prior to becoming pregnant, there has been a rise in interest in the potentially harmful effects of excessive weight gain during pregnancy, regardless of the woman's size at the beginning of her pregnancy [8].

Contrarily, maternal underweight has a number of negative effects on both the mother and the fetus, most of which are related to the mothers' inadequate nutritional status [9].

Preeclampsia occurred substantially more frequently in women with morbid obesity than in other categories, according to the results of the current study. According tostudy of Marshall et al., 2012 which examined the impact of maternal super obesity (BMI 50kg/m^2) compared to morbid obesity (BMI 40-49.9kg/m^2) or obesity (BMI 30-

39.9kg/m^2) on pregnancy outcomes, the latter two conditions are not as harmful to the fetus as the former. When compared to obese women in their study, women who were severely obese had a much higher frequency of preeclampsia [10].

The study also discovered that preterm labour occurred substantially more frequently among women who were underweight. This is in line with a study by Fujiwara et al., 2014, which sought to assess the risks for adverse pregnancy outcomes in pre-pregnant underweight women and establish relationships between maternal pre-pregnancy underweight and those outcomes. In their study, premature birth was considerably more common in underweight pregnancies than in pregnancies with normal weight [11].

In terms of the relationship between mode of delivery and BMI, we discovered that women in group 5 (morbidly obese) experienced much more CS than women in other groups. This is consistent with the findings of Mamun et al., [12] who studied the effect of BMI on pregnancy outcomes and found that morbid obesity was associated with increased CS delivery.

In this study, fetal macrosomia was substantially more common in obese and morbidly obese women. This is consistent with the study of Calderon et al., [13]. Additionally,women who were morbidly obese had a considerably higher prevalence of perineal tears and manual removal of placenta and this is consistent with the study of Bautista-Castano et al., [14].

The current study discovered that neonates delivered to morbidly obese mothers had a considerably greater frequency of LGA while those born to underweight women had a significantly higher frequency of SGA in respect to the link between BMI and neonatal outcome. Although newborns with poor Apgar scores and NICU hospitalization were more common among mothers in the underweight and morbidly obese groups, the difference is not statistically significant. Our study concurs with study of Sebire et al., [15] which identified the unfavorable pregnancy outcomes for both the mother and the fetus in relation to low BMI in an unselected population. In the underweight group antenatal anemia, preterm delivery and birth weight below the 5th centile were more frequent than in women of normal BMI. In study of Jeric et al., [9] founded that neonates of underweight mother were lesser in weight and shorter in length than those of normal BMI.

Conflict of interest statement: The authors have declared that no competing interests exist.

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مؤشر كتلة الجسم فى الأشهر الثلاثة الأولى ونتائج الحمل السلبية

مقدمة : تم استخدام مؤشر كتلة الجسم لتصنيف النساء بالدراسة بإجمالى مائة حالة إلى خمس مجموعات متساوية كل منهم عشرون سيدة ناقصات الوزن، وذوات الوزن الطبيعى، والوزن، الزائد، والسمينات، والمسنة المفرطة.

الهدف من الدراسة : هو التحقيق فى كيفية تأثير مؤشر كتلة الجسم على نتائج الحمل.

الإستنتاجات : فى هذه الدراسة وجد أن النساء المصابات بالسمنة أكثر عرضة لارتعاج الحمل، الولادات القيصرية، تهتك بالعجان والحاجة للإزالة اليدوية للمشيمة مقارنة بمجموعات النساء الأخرى. بالإضافة إلى ذلك، كان لدى النساء ناقصات الوزن معدلات أعلى للمخاض المبكر وجدت الدراسة أن المواليد حديثى الولادة لنساء يعانين من السمنة المفرطة لديهم نسب أعلى لزيادة الوزن فى حين أن أولئك الذين يولدون لنساء ناقصات الوزن لديهم نسب أعلى لنقص الوزن.

الخلاصة : النساء البدينات فى بداية الحمل معرضات لخطر متزايد من اضطرابات ارتفاع ضغط الدم أثناء الحمل وسكرى الحمل ومضاعفات أثناء الولادة مثل الولادة المتعسرة وارتفاع معدلات العمليات القيصرية. ومن ناحية أخرى، نقص وزن الأمهات يرتبط بالعديد من العواقب المترتبة على الأمهات والاجنة والتى تعزى إلى سوء التغذية.