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Adverse outcomes of obesity on pregnancy

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Abstract

Background and objectives: The prevalence of maternal obesity has increased in recent years. This study aimed to assess the impact of mothers being of an average weight versus obese ones regarding pregnancy outcomes and to evaluate the association between the body-mass index and the modality of delivery. **Methods:** A retrospective study was carried out at Erbil Maternity Teaching Hospital from March-2018 to March-2019. Three hundred and twenty-six (n=326) pregnant women were included and divided into two groups. Group one (171) women with a healthy body mass index (18.5-24.9 kg/m2) and group two (155) women with body mass index (>30 kg/m2). We compared the two groups for maternal and neonatal outcomes of pregnancy. **Results:** A total of 155 women were obese. More than half (57.9%) of the normal-weight women had attended the antenatal care clinics, compared with (45.2%) of the obese group. Gravidity, parity, as well as the number of abortions, were significantly higher in Group II. The average gestational age of women in the normal-weight group was 38.83 weeks, which was more significant in comparison with obese women. On the other hand, the weight of the neonates of the obese group was 3.82 Kg, which was significantly higher than in neonates (3.49 Kg) of controls. Further, the head circumference of the neonates of the obese group (35.92 cm) was considerably higher. **Conclusions:** Obesity carries significant risks to maternal and fetal health. Effective public, as well as primary healthcare strategies, are mandatory to prevent and manage this dilemma at early stages.

Key words: Body Mass Index,Maternal Health,Obesity,Pregnancy.

Introduction

Obesity is a medical entity in which more than average body fat has accumulated to the extent that it may harm health, leading to a reduced life expectancy[1]. This collection of intra-abdominal (visceral) fat can result in a set of metabolic disorders. Obesity is regarded as a global health problem of the 21st century. In 2008, the World Health Organization (WHO)
estimated that around 205 million and 297 million men and women respectively, over the age of 20 were obese, and a total of more than half a billion adult worldwide[2]. Obesity contributes to significant morbidity and mortality attributed to several medical conditions, including cardiac diseases, diabetes, and malignant neoplasm[3,4]. The increase in obesity is affecting women of child-bearing age and is associated with an increased burden on the public health as a whole[1, 2]. A review published by Guelinckx et al. refers to a prevalence of obesity in pregnant women, varying between 1.8% and 25% depending on ethnographic distribution[5]. Moreover, a previous study by Bautista-Castaño revealed the prevalence of obesity in pregnant women is 17.1%[6]. Maternal obesity correlates with long-term consequences affecting maternal as well as the subsequent generations, including postpartum weight retention, metabolic syndrome, and obesity[7-9]. Large-scale population-based aggregate epidemiological studies indicate that a high pre-pregnancy body weight confers on the increased risk of maternal complication including, pre-eclampsia, gestational diabetes, delivery by a cesarean section (CS), neonatal macrosomia, and stillbirth[10-12]. Identification of these risk groups and critical entities of gestational weight gain should be valid for the development of preventive strategies[1, 2]. Increasing maternal body mass index (BMI) is known to be at risk of evident antenatal, intrapartum, postpartum, and neonatal complications. Prenatal complications include recurrent miscarriages, pregnancy-induced hypertension (PIH) and pre-eclampsia, and gestational diabetes mellitus (GDM)[13,14]. Our study aims to evaluate maternal
and neonatal outcomes of the pregnancy in obese women

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compared to those of average (healthy) weight, using a validated compiled database, by reviewing a large number of singleton pregnancies admitted to Erbil Maternity Teaching Hospital[15].

Material and Methods

This study is observational and retrospective, and it was conducted at the Maternity Teaching Hospital in Erbil from March 2018 to March 2019. The medical ethics committee of the College of Medicine at Hawler Medical University approved the study protocol [Metting Code 4, Paper Code 10, Date 27-03-2018]. Participants in the study granted their informed consent to be allowed to participate in the study. We collected a total number of 326 pregnant women (n=326) around the time of childbirth (peripartum period), and they were monitored for one week after delivery. The neonates were followed-up for one week as well. We have divided the study sample into two groups assigned to; Group I which include 171 (52.5%) pregnant women with a healthy BMI (18.5 to 24.9 kg/m2), and Group II which Include 155 (47.5%) obese pregnant women (i.e., BMI>30 kg/m2). Accordingly, each group consisted of pregnant women in the peripartum period, and a team of physicians and the paramedical staff monitored the mothers and the newborns for one week after labor1. The researchers designed a piloted questionnaire, based on already-established diagnostic criteria, to retrieve data relevant to the research question in an aim to evaluate both groups1,2,5,6. To assess the maternal outcomes of the pregnancy, we evaluated a set of parameters including hypertension (HPT), gestational hypertension and pre-eclampsia (PET), gestational diabetes mellitus (GDM), and the mode of delivery either vaginal delivery (VD) or cesarian section (C/S), as well as specific parameters that are relevant to the fetus including shoulder dystocia, macrosomic baby, and postpartum hemorrhage (PPH).

To assess the neonatal outcomes of the pregnancy, we evaluated the physical characteristics of the neonate represented by biometric parameters including standardized measurements of the birth weight, Apgar score, gender, admission to neonatal care unit, congenital anomaly, and gestational age.

We included both primigravida and multigravida, females with a singleton pregnancy, conceptions with the cephalic presentation, gestational age of 37-42 weeks, and mothers of in the range of 20-35 years of age who may or may not have attended the antenatal clinic. We excluded mothers with a history of prior C/S, a history of severe hyperemesis gravidarum, pregnant, established cardiovascular diseases, thyroid diseases, hematologic diseases, autoimmune diseases, and women with preexisting medical conditions were excluded in this study to avoid confounding variables in subsequent data analysis (exclusion criteria). We analyzed data using the Statistical Package for Social Sciences (IBM-SPSS, version 22). Chi-Squared test of association, Fisher's Exact test, and Student's t-test of two independent samples were deployed at an alpha value of 0.05 and a confidence interval of 95%.

Results

Two groups of women participated in the study; group I (n=171, 52.5%) whose BMI was less than 25 Kg/m^2 (normal weight women, i.e., controls) and group II (n=155, 47.5%) whose BMI was > 30 Kg/m2 (obese women).

The mean age + SD of group I was 24.19 + 3.44 years, and that of group II was 27.51 + 4.49 years as presented in Table 1. Statistical analysis shows that the gravidity, parity, and the number of abortions were significantly higher in Group II as compared to Group I. The average gestational age of the normal-weight women was 38.83 weeks while that of the obese women was 38.94 weeks (p-value=0.422) as presented in Table 1.

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Table (1): Mean values of the maternal variables for the two study groups.

Maternal variable	BMI < 25 Kg/m^2 Mean(±SD)	BMI ≥ 30 Kg/m^2 Mean(±SD)	p-value
Age (years)	24.19(±3.44)	27.51(±4.49)	< 0.001
Gravida	2.18(±1.45)	3.38(±1.93)	< 0.001
Para	1.09(±1.38)	2.16(±1.78)	< 0.001
Miscarriage	0.08(±0.30)	0.23(±0.65)	0.012
Gestational Age	38.83(±1.21)	38.94(±1.14)	0.422

Table 2 shows that more than half (57.9%) of the normal-weight women had attended the antenatal care clinics, compared to (45.2%) of the obese group (p-value=0.022). The table shows that the incidence of pre-eclampsia was significantly higher in the obese group in comparison with the normal-weight women (18.7% versus 3.5%, p-value <0.001). The frequency of GDM was higher among obese women (19.4% versus 1.2%, p-value <0.001). Urinary tract infection (UTI) recorded at 55.5% in the obese group compared to 39.2% in the control group (p-value =0.003). The incidence of history of intra-uterine death (IUD) was also significantly higher in the obese group (18.7% versus 6.4%, p-value =0.001).

Table (2): Obstetrical history of the study groups.

Obstetrical history	BMI < 25 Kg/m^2 No.(%)	BMI ≥ 30 Kg/m^2 No.(%)	Total No.(%)	p-value
Antenatal care				
Yes	99(57.9)	70(45.2)	169(51.8)	
No	72(42.1)	85(54.8)	157(48.2)	0.022
Pre-Eclamptic Toxaemia				
Yes	6(3.5)	29(18.7)	35(10.7)	
No	165(96.5)	126(81.3)	29(89.3)	< 0.001
Gestational Diabetes				
Yes	2(1.2)	30(19.4)	32(9.8)	
No	169(98.8)	125(80.6)	294(90.2)	< 0.001
Urinary Tract Infection				
Yes	67(39.2)	86(55.5)	153(46.9)	
No	104(60.8)	69(44.5)	173(53.1)	0.003
History of Intra-Uterine Death				
Yes	11(6.4)	29(18.7)	40(12.3)	
No	160(93.6)	126(81.3)	286(87.7)	0.001
Total	171(100.0)	155(100.0)	326(100.0)	

In Table 3, the implementation of CS among the obese group was significantly higher than that of the control group (35.5% versus 14.6%, p-value <0.001). The occurrence of macrosomia was also higher among the neonates of obese women who had delivered vaginally compared with neonates of women from the comparison group (30% versus 13%, p-value =0.001). However, the researchers detected no significant differences in between the two study groups regarding postpartum hemorrhage (p-value =0.812), and the gender of the newborn babies (p-value =0.359).

Nevertheless, the incidence of stillbirth among the normal weight women (5.8%) was substantially higher than in obese women (p-value =0.002), where no stillbirths were counted (0%). Furthermore, the records of the Intensive Care Unit (ICU) indicates that in the obese group, there was an admittance rate of 11.3%. Besides, the incidence of congenital anomalies was 0.9%, and that of asphyxia was 10.5%, but all the differences between the two study groups were not significant (p-value =0.887, p-value =0.250, and p-value =0.930 respectively).

Table (3): Maternal and neonatal outcomes.

Outcomes	BMI < 25 Kg/m^2	BMI ≥ 30 Kg/m^2	Total	
	No.(%)	No.(%)	No.(%)	p-value
Mode of Delivery				
Vaginal	146(85.4)	100(64.5)	246(75.5)	
Caesarean Section	25(14.6)	55(35.5)	80(24.5)	< 0.001
If vaginal				
Macrosomic	19(13.0)	30(30.0)	49(19.9)	
None	127(87.0)	70(70.0)	197(80.1)	0.001
Postpartum Hemorrhage				
Yes	27(15.8)	23(14.8)	50(15.3)	
No	144(84.2)	132(85.2)	276(84.7)	0.812
Gender of neonate				
Male	94(55.0)	93(60.0)	187(57.4)	
Female	77(45.0)	62(40.0)	139(42.6)	0.359
Neonatal outcome				
Alive	160(93.6)	155(100.0)	315(96.6)	
Macerated	1(0.6)	0(0.0)	1(0.3)	
Stillbirth (all types)	10(5.8)	0(0.0)	10(3.1)	0.002*
Admission to ICU Unit				
Yes	19(11.1)	18(11.6)	37(11.3)	
No	152(88.9)	137(88.4)	289(88.7)	0.887
Congenital Anomalies				
Yes	3(1.8)	0(0.0)	3(0.9)	
No	168(98.2)	155(100.0)	323(99.1)	0.250*
Presence of Asphyxia				
Yes	17(10.6)	16(10.3)	33(10.5)	
No	143(89.4)	139(89.7)	282(89.5)	0.930

* Calculated by Fisher's exact test.

The average weight, measured in kilograms (Kg), of the neonates of the obese group, was significantly higher than the corresponding parameter in the comparison group (3.82 versus 3.49, p-value<0.001). Additionally, the head circumference, measured in centimeters (cm), of the neonates of the obese group was significantly higher than the mean of the controls (35.92 versus 34.47, p-value<0.001). However, there was no significant difference among the two groups regarding the Apgar scores at one minute and five minutes post-delivery.

Table (4): Means of the neonatal variables of the two study groups.

Neonatal variable	BMI < 25 Kg/m^2	BMI ≥ 30 Kg/m^2	p-value
	Mean(±SD)	Mean(±SD)	
Weight of neonate	3.49(±0.49)	3.82(±0.55)	< 0.001
Head circumference (cm)	34.47(±1.99)	35.92(±1.98)	< 0.001
Apgar (after 1 minute)	7.52(±1.50)	7.73(±0.81)	0.121
Apgar (after 5 minutes)	8.50(±1.64)	8.74(±0.73)	0.091

Discussion

Our study reached a definite conclusion, based on inferential models of biostatistics, that increasing maternal body weight was associated with adverse outcomes not only for the mother but also for her baby as well. This finding has been pointed out in earlier studies in showing a relationship between increasing BMI and an increased risk of PE, GDM, CS procedures, and increased risk of having a macrosomic baby[16, 17]. In concordance with prior research attempts, the present study indicates that the risk of HPT and GDM before and during pregnancy are augmented in obese women[18, 19]. Chu et al conducted a meta-analysis exploring the association between gestational DM and BMI, and they have estimated that the risk of developing gestational diabetes to be higher among obese females[20]. Our study showed a significant correlation between BMI and the mode of delivery. The rate of C/S for the obese group was 35.5% compared to 14.6% in the healthy-weight pregnant women. It also demonstrates that VD modality decreases with an increased BMI (84.4% in normal-weight women versus 64.5% in obese women). This observation is consistent with previous study efforts. However, it departs from other research attempts, which demonstrated that there was no significant

difference between obese and normal weight pregnant women regarding the mode of delivery[21-23]. The increment of the need for an emergency C/S could be, in part, a consequence of increased rate of a macrosomic infant, or due to suboptimal uterine contractility in obese women, or as a result of increased fat deposition in the soft tissue of pelvis leading to an obstructed labor. In our study, the incidence of stillbirth was zero in obese women while being 5.8% in normal-weight pregnant women with no significant demonstrable association between maternal BMI and maternal mortalities. Leung et al. agree with our results that an increasing BMI was not associated with a raised risk of early neonatal death[24]. Fetal birth weight was statistically higher in newborns of obese mothers compared with non-obese mother. Similarly, Bautista-Castano et al. reported that the newborn weight, based on regression model analytics, was directly correlated with the maternal baseline BMI[25]. Concerning the intrauterine growth restriction (IGUR), our data indicate that maternal BMI did not have any influence, although Perlow et al. suggested an increased risk in obesity[26]. Future studies of higher level-of-evidence and statistical power are critical for cross-validation. Finally, there were no cases of maternal mortalities in our sample albeit that a recent analytic on maternal deaths in Australia (1997-1999) concluded that obstetric bleeding is the leading direct cause of maternal mortality which was postulated to be the result of increasing rates of cesarean deliveries[27].

Conclusions

Obesity in pregnancy increased the risk of hyperglycemic disorders, cesarean delivery, urinary tract infections, and fetal macrosomia. Not only does maternal obesity affect the woman, but it also impacts the health of the child, leading to increased neonate obesity. Hence, It is crucial to promote the normalization of body weight in women who are planning to be pregnant and to provide appropriate advice on the risks of obesity at the start of the pregnancy. Nutritional support, physical exercise, and close monitoring of maternal weight pre-pregnancy and during pregnancy can be useful. Future preventive strategies focused on pre-pregnancy BMI are needed. Health economic modeling, via cost-benefit analyses, are also mandatory for assessing the interventions aimed at reducing obesity.

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