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Maternal and perinatal outcomes in relation to body mass index

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Abstract

Background and objectives: Maternal obesity has become a global threat and has a major public health burden to the mother and her baby. The prevalence of maternal obesity has risen in the past two decade. The aim of the study is to compare maternal and perinatal outcomes of pregnancy in relation to BMI.

Methods: It is an observational case con sectional study which was conducted in Sulaimani maternity teaching hospital/Kurdistan region of Iraq, from August 1st 2015-August 1st 2016. A total of 300 women of prime and multigravida with singleton term pregnancy (37- 42weeks), cephalic presentation, age (18-45) year were included. Weight and height were taken from booking visit.

Results: Significant difference was found in mean age of the three groups with older women tend to become more obese. There was significant association of obesity with increase. Obesity will increase the risk of gestational hypertension, gestational diabetes and antepartum hemorrhage. Moreover, the rate of caesarean section increasing with higher body mass index. Postpartum hemorrhage showed significant association with obesity. Higher body mass index women are more likely to give birth to macrocosmic babies and admission to the neonatal intensive care unit.

Conclusion: Obesity increases the risk of delivery by caesarean section, and is associated with increased incidence of hypertension, gestational diabetes, post-partum hemorrhage and macrocosmic baby. Babies of obese women have a high incidence of admission to the neonatal intensive care unit.

Key words: Obesity, Gestational diabetes mellitus, Antenatal Complications.

Introduction

Obesity is a worldwide health problem in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduce life expectancy. The World Health Organization (WHO) has described obesity as one of the most important threats to human health. Obesity is associated with an increased risk of type two diabetes mellitus (DM), hypertension, ischemic heart disease (IHD), sleep apnea and osteoarthritis.[1] Thus hyperinsulinemia is common in all pregnant women, with higher levels seen in obese women. During pregnancy obese women face a higher risk of developing gestational diabetes mellitus GDM, gestational hypertension as well as preeclampsia.[2] 17% of obese women develop GDM during pregnancy compared to only 3% in normal weight women. So any pregnant woman with BMI >29.9 should be screened with a 75gm oral glucose tolerance test (OGTT) .[3]The majority of studies show that maternal obesity is strongly correlated with the risk of pre-eclampsia.[4] The risk of pre-eclampsia typically doubled with each 5-7kg/m^2 increases in pre pregnancy BMI.[5]

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The literature shows that obese pregnant women have a 14-25% incidence of pre-eclampsia.[6] Venous thrombo-embolic (VTE) complications are a leading cause of maternal mortality in developed world.[7] The Royal College of Obstetrician and Gynecology (RCOG) report on maternal deaths (CEMACH) concluded that obesity is the most common risk factor for VTE.[8] Therefore, it seems important to identify obese women who are at increased risk of VTE at booking clinic, and according to their risk factors classify them to high and low risk women so low molecular weight heparin (LMWH) is an effective thrombo-prophylaxis in pregnancy.[8] Observational studies have reported an increase in shoulder dystocia[9] and the rate of cervical dilatation was inversely proportional to maternal BMI also the duration of labor was significantly longer for overweight and obese women than for normal weight women.[9] Fetal monitoring in labour may be technically challenging with increasing levels of abdominal obesity. Assistance during delivery, such as the use of forceps, cesarean section (C/S) and associated morbidities are more common among obese women.[9] A study found that obese women were more likely to have labour induction, failure of progress (FOP) during the first stage of labour, meconium stained amniotic fluid, malpresentations and C/S than non-obese women.[10] Postpartum complications: Excess weight and limited mobility are considered major risk factor for developing blood clots and VTE which is important because pulmonary embolism (PE) is the leading cause of maternal mortality in the developed world and it is preventable, and recent seminar reported that a maternal BMI more than 29.9 kg/m was associated with increased risk of ante-partum and postpartum VTE.[11] The objective of the study was to compare maternal and perinatal outcomes of pregnancy in relation to BMI.

Patients and methods

This is a cross sectional prospective study conducted in Maternity Teaching Hospital, Sulaimani Kurdistan region, Iraq. The study was conducted from August 1st / 2015 to August 1st /2016. A total number of 300 pregnant women were included in this study. Body mass index BMI is calculated from the height and weight of an individual where the weight in kilograms (Kg) or pounds (lb.) is divided by the square of height in meters (m) or inches (in). The studied women were divided into three groups according to their BMI categories and followed up for maternal & neonatal complications in the term of birth weight, Apgar scores, and admission to neonatal intensive care unit NICU. First group with normal BMI from (18.5kg/m²- 24.9 kg/m²) regarded as control group, the second group overweight with BMI from (25kg/m²-29.9 kg/m²), and third group obese with BMI above 30kg /m². Each group consists of 100 pregnant women. Women were monitored in labour and up to 24-hour post-natal, the neonates were followed up for one week. Inclusion criteria include prime gravid and multi gravid, singleton, term pregnancy (38-42) week's gestation, cephalic presentation, age group (18-45 years). Exclusion criteria include prior cesarean section, abnormal presentation women with medical disease before pregnancy (hypertension, diabetes mellitus, heart disease, thyroid disorder, blood disease and autoimmune disease taken by direct interview and recorded, pregnant women were observed for developing each of gestational diabetes, relaying on Glucose Tolerance Test (GTT) from 24-28 weeks of gestation Gestational hypertension, and antepartium hemorrhage. This study was approved by the research ethical committee of the Kurdistan Higher Council for Medical Specialties, Erbil, Iraq. Verbal consent for the study was obtained from all the patients. Computerized statistical software used for entering all data Statistical Package for

Social Sciences (SPSS) version 21 was used for analysis. Descriptive statistics presented as (mean ± standard deviation) and frequencies as percentages. Kolmogorov Smirnov analysis verified the normality of the data set. Multiple contingency tables conducted and appropriate statistical tests performed, Chi-square used for categorical variables (Fishers exact test was used when expected variables were less than five) and one-way ANOVA analysis was used to compare between more than two means. In all statistical analysis, level of significance (p value) set at≤ 0.05 and the result presented as table.

Results

There was a significant association between increased maternal age, low educational level (illiterate and primary) increased parity and increased BMI (p<0.001). No significant differences were observed between pregnant women with different BMI regarding gestational age groups (p=0.8). Table (1**).**

Table (1): Distribution of sociodemographic characteristics in relation to BMI of pregnant women

Variable	Normal		Overweight		Obese		χ^2	P
	No. 100	%	No. 100	%	No. 100	%		
Age							37.9*	<0.001
< 20 years	31	31.0	17	17.0	9	9.0		
20-29 years	59	59.0	50	50.0	48	48.0		
30-39 years	10	10.0	30	30.0	36	36.0		
≥ 40 years	0	-	3	3.0	7	7.0		
Educational level							19.2	0.004
Illiterate	10	10.0	13	13.0	25	25.0		
Primary	20	20.0	25	25.0	33	33.0		
Secondary	28	28.0	28	28.0	22	22.0		
University &higher	42	42.0	34	34.0	20	20.0		
parity							32.2	<0.001
prime	68	68.0	55	55.0	29	29.0		
multi	32	32.0	45	45.0	71	71.0		
Gestational age							0.3	0.8
37-40 wks.	92	92.0	93	93.0	90	90.0		
≥41 wks.	8	8.0	7	7.0	10	10.0		

*Fishers exact test

There was a significant association between Hypertenino(HTN), Gestational Diabetes (GDM), Antepartium Haemorrhiage(APH) and increased BMI of pregnant women (P = 0.001, P < 0.001, P < 0.003 respectively) Table 2: Distribution of HT and GDM and APH according to BMI of pregnant women as shown in Table (2).

Table (2): Distribution of HT and GDM and APH according to BMI of pregnant women

Variable	Normal		Overweight		Obese		χ^2 14.1 17.0	P
	No.	%	No.	%	No.	%		
Hypertension	5	5.0	13	13.0	22	22.0		
GDM	3	3.0	5	5.0	17	17.0		
APH	2	2.0	5	5.0	14	14.0	11.9	0.003

There was significant association was observed between caesarean section delivery and increased BMI of pregnant women (p=0.004) as shown in Table (3).

Table (3): Association between caesarean section delivery and BMI of pregnant women

Variable	Normal		Overweight		Obese		χ^2	P
	No.100	%	No.100	%	No.100	%		
Mode of delivery							15.2	0.004
Normal vaginal delivery	78	78.0	68	68.0	55	55.0		
Instrumental delivery	2	2.0	5	5.0	12	12.0		
C/S	20	20.0	27	27.0	33	33.0		

CS it mean caesarean section

There were no statistical significant differences between pregnant women with different BMI regarding C/S indications (p=0.8). Table (4).

Table (4): Relation of different BMI values with C/S indication

Variable	Normal (20)		Overweight (27)		Obese (35)		χ^2	P
	No.	%	No.	%	No.	%		
C/S indications							5.5*	0.8
Fetal distress	7	35.0	9	33.3	8	24.2		
FOP in 1st stage	5	25.0	6	22.2	8	24.2		
Medical disease	2	10.0	5	18.5	8	24.2		
FOP in 2nd stage	2	10.0	4	14.8	7	21.2		
APH	3	15.0	2	7.4	1	3.0		
Cord prolapse	1	5.0	1	3.7	1	3.0		

Table (5): Mean birth weight after labour was 3.5±0.5 Kg, four pregnant women had infant with low birth weight.

Variable	No. 300	%100
Birth weight weight means (3.5±0.5 Kg)		
Low	4	1.3
Normal	255	85.0
Macrosomic	41	13.7
APGAR score at 1 minute means (7.4±1.4)		
Low	65	21.7
Normal	235	78.3
APGAR score at 5 minutes means (9.2±1.1)		
Low	12	4.0
Normal	288	96.0

There was a significant association between high NCU admissions. No significant differences were observed regarding neonatal outcome followed up for one weeks, shoulder dystocia, congenital anomaly and NCU admission indications (p>0.05). Table (6)

Table (6): Association of neonatal outcome and BM1

Variable	Normal		Overweight		Obese		χ^2	P
	No.	%	No.	%	No.	%		
Shoulder dystocia	1	1.0	4	4.0	7	7.0		
							0.5*	0.7
Congenital anomaly	1	1.0	1	1.0	2	2.0		
Neonatal outcome							10.0*	0.1
Alive	100	100.0	100	100.0	96	96.0		
Fresh stillbirth	0	-	0	-	1	1.0		
Macerated stillbirth	0	-	0	-	3	3.0		
							42.25	
Early neonatal death	0	-	1	1.0	0	-		
NICU admission	7	7.0	32	32.0	49	49.0		
Indications of NICU admission								
Instrumental delivery	2	28.6	4	12.5	9	18.8		
Meconium	0	-	6	18.8	7	12.5		
Macrosomia	2	28.6	8	25.0	15	31.3	5.7*	0.8
GDM	1	14.3	4	12.5	10	20.8		
Shoulder dystocia	1	14.3	4	12.5	4	8.3		
Others	1	14.3	6	18.8	4	8.3		

**Fishers exact test*.

Discussion

Evidence is strongly suggesting that the obesity is a global epidemic, and the prevalence of overweight and obesity is increasing worldwide. Many studies evaluated the correlation between body mass index and the outcome of pregnancy and found that obesity can contribute to many complications during pregnancy.[1] This study tries to demonstrate outcome of pregnancy in relation to maternal BMI and has provided quantification of these risks. Our study showed significant difference in BMI

between primiparous and multiparous women, and it seems that women tending to become more obese with increase parity (P<0.001).This finding agrees with that of Manzanarez et al who found that obese women showed higher parity compared to normal weight women.[12] and also agrees with that of Christian et al.[13] Also significant association was found in the mean age in the three BMI categories with mean age in obese category 28.9±6.4 ,while in overweight and normal weight category was 26.8±6.4, 22.6±4.6 ,respectively, with (P<0.001). This is consistent with what was found by Louis A et al that higher BMI is associated with older age and also agrees with Manzanarez etal.[12]

Although in this study the number of those mothers attending university was (32%) higher in compare to the lower education level (16%, 26%, 26%) for illiterate and primary and secondary school, respectively. which is inconsistent to that of Christian et al who found fewer number of obese pregnant women had gone beyond high school (P = 0.034).[13] Our study didn't show any significant association between maternal BMI and gestational age at delivery (P=0.8). This agrees with Bhattacharya et al that showed the same result.[14] while Sarkar study found that gestational age was significantly lower in obese women than other two BMI groups.[2] Our study confirms the increased risk of antenatal complications of pregnancy in obese and overweight women compared to normal BMI women like gestational hypertension, gestational diabetes and antepartum hemorrhage. Our finding agrees with Bhattacharya et al.[14] who showed the same result. In addition to Christian et al who found that in the obese group, 30 women and in non-obese group only 13 women suffered from severe pre-eclampsia (p=0.006).[13] Regarding GDM in our study, the risk increased with increased BMI in a rate of (17%) in obese women and (3%) in normal BMI pregnant women with (P<0.001). Our result agrees with Christian et al.[13] The study confirmed significant association between antepartum hemorrhage and obese pregnant women with 14% of obese group had antepartum hemorrhage while only 2% in normal weight group (p=0.003). This result disagrees with a study made by Salihu et al who found that obese women were less likely to have placental abruption than normal weight women. In our study there were no significant association between increased BMI and increased risk of IUFD (P>0.05), however, the rate was 3% in obese and 0% in normal weight but this has failed to be statically significant. This disagrees with Cedergren et al who showed significant association between maternal obesity and IUFD[15]. Also in Kristensen et al study; maternal obesity was associated with more than doubled risk of IUFD; however, the same study found no significant increase in the risk of IUFD among overweight women, and this is similar to our study [16]. Our study could not prove any significant association between increased BMI and increased risk of congenital anomalies (P>0.7), the rate of congenital anomaly in three groups were approximately equal with 2% in obese and 1% for both over weight and normal weight category, respectively. This may be due to small sample size. This result disagrees with Block et al who showed that the prevalence of any birth defect increases with increased BMI (P<0.001).[17] Regarding increase birth weight and obesity we found that there is significant association between them with (mean 3.6±0.5, 3.4±0.5, 3.2±0.4) for obese, overweight, and normal weight women, respectively, (P<0.001). This is consistent with what was found by Christian et al, where there was a statistical significant difference in the number of women in the obese and non-obese group who gave birth to macrosomia babies (>4000gm), with (P=0.015).[13] This also agrees with Chu SY et al who found that the prevalence rates of fetal macrosomia were 13.3% and 14.6% for obese and morbidly obese women, respectively, compared with 8.3% for the normal weight control group.[18] We found that there is a highly significant association between obesity and low Apgar score of infants in first minute and fifth

minutes with P value of (<0.001, 0.04) respectively, which is compatible with what was found by Christian et al study who found poor first minute APGAR score of less than seven was significant in obese group (p = 0.035) .[13] There was a significant association between number of infant admitted to neonatal intensive care unit and maternal obesity, with 49% admission in obese category and 32% in overweight group and only 7% in normal weight women (P<0.001), However, there was no significant difference in indication for admission to NICU with (P=0.8). Our study showed significant association between BMI category and the mode of delivery (P= 0.004), with increasing the rate of delivery by C/S as we move into higher BMI category (33%,27%) in obese and overweight women respectively, compared to (20%) in normal weight women. These results agree with Athukorala et al .[19] Although there was major difference in the indications for C/S in our study between the three categories, with more CTG abnormality, FOP in first and second stage with medical disease complicating pregnancy in obese group (24%, 24%, 21%, 24%) respectively, but still has not reach statistically significant rate with (P 0.8). Cedergren et al, showed higher incidence of instrumental delivery in obese women compared to normal weight women.[15] In our study the overall incidence of instrumental delivery was 6.3%, and contributes to one tenth of delivery of obese women.

Conclusions

There is growing acknowledgment that maternal obesity is common issue and therefore, it is one of the most important challenges facing modern obstetrics. Gestational diabetes mellitus increased by fivefold and hypertension by four fold in patients with obesity in comparison to normal weight patients. Increase in BMI increases the risk of delivery by cesarean section and PPH. Newborn of obese women has a higher incidence of macrosomia, admission to the neonatal intensive care unit due low APGAR score

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Conflict of interest

The author reports no conflicts of interest

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