PREGNANCY OUTCOMES DO INFLUENCE BY EXTREMES OF BODY MASS INDEX

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ABSTRACT

Objective: To investigate whether extreme of body mass index (BMI) is associated with pregnancy outcomes.

Study Design: Retrospective cohort study.

Place and Duration of Study: Hamdard University Hospital, Karachi, Pakistan, from Feb 2019 to Jan 2020.

Methodology: We conducted a retrospective cohort study of 1000 women delivered in between February 2019 to January 2020. BMI is categorized into four groups according to the Asian-Pacific cutoff points as underweight (<18.5 kg/m²), normal weight (18.5–22.9 kg/m²), overweight (23–24.9 kg/m²), and obese (>25 kg/m²). Maternal outcomes measured were pre-eclampsia, gestational diabetes, delivery by cesarean section, instrumental delivery, anemia, postpartum hemorrhage and fetal outcome included small for gestational age and large for gestational age. Logistic regression model was used to adjust the confounder. Maternal outcomes were evaluated with relative risks and 95% confidence intervals.

Results: In results, 13%, 54%, 22%, 9% and 2% were underweight, normal body mass index, overweight, obese and morbidly obese categories respectively. The gestational diabetes, pre-eclampsia, labour induction, frequency of cesarean section, post-partum hemorrhage increased linearly with increasing body mass index and expressed as adjusted odds ratio (95% confidence interval) respectively: 10.0 (95% CI 3.5, 28.7), 5.3 (95% CI 2.0, 14.1), 2.7 (95% CI 1.1, 6.8), 4.9 (95% CI 2.8–8.8), 2.5 (95% CI 0.31–20.6). The anemia and small for gestational age were found in underweight group with adjusted odd ratio2.47 (95% CI 1.6–3.6), 4.6 (95% CI 2.6, 8.1) respectively.

Conclusion: Obese women are more prone to have maternal and fetal complication which includes preeclampsia, gestational diabetes, caesarean section rate, labor induction and macrosomic babies. Underweight women are not risk free for complication as they are associated with anemia and small for gestational age.

Keywords: Pregnancy outcome, Body mass index, Obesity, Large for gestational age.

INTRODUCTION

The worldwide prevalence of obesity has been increasing and abnormal body mass index plays a major role to the attribution of chronic illness[1]. Obesity pondered to be major health burden not in developed but in underdeveloped countries[2]. According to population based survey the prevalence of obesity is increasing in female Pakistani population and itstrend has been increasing with advancing age[3]. It has been estimated that greater than one-third women aged 20 years and above in Pakistan are with abnormal body mass index[4]. According to survey, 26% of Pakistani women were classified as obese as compared to men who were 19%[4].

Body mass index (BMI) is considered to be an important gauge of pregnancy outcomes. Abnormal body mass index whether underweight or being obese may increase the risk of adverse pregnancy outcome. Various studies[5,6] have shown that obesity contributed to occurrence of pregnancy complications such as gestational diabetes, pregnancy induced hypertension, post-partum hemorrhage, macrosomia and stillbirth. Whereas pregnancy with underweight BMI, increased the risk of anemia and intrauterine growth retarda-tion[7].

Different studies have been done showing obesity with pregnancy outcome. There is paucity of data showing the effects of extreme of body mass index (BMI) on maternal and fetal outcomes. Therefore the objective of this study was to observe whether extremes of BMI (low or high) is linked with obstetric outcomes compared with women of normal BMI and to assess such risk in order to provide factual data for counseling women.

METHODOLOGY

A retrospective cohort study was conducted on 1000 singleton women delivered from February 2019 to January 2020. This study was approved by ethics review committee of department of Obstetrics and Gynaecology, Hamdrd University Hospital, Karachi. All pregnant women were enrolled in the study, who met the inclusion criteria. The inclusion criteria were singleton pregnancy, booked before 16 weeks of gestation and complete medical record available. The women with multiple pregnancies, booked after 16 weeks of gestation, incomplete medical record and medical

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condition like essential hypertension, diabetes mellitus and renal diseases were excluded from the study. The previous medical record was reviewed and information gathered in predesigned proforma. 1st trimester maternal height and weight was recorded and BMI was calculated.

BMI was calculated as weight in kilograms divided by the square of the height in meters (kg/m^2). According to the Asian-Pacific cutoff points[8], BMI was divided into four groups as underweight normal weight overweight and obese (18.5 kg/m^2), (18.5-22.9 kg/m^2), (23–26.9 kg/m^2), and (>25 kg/m^2) respectively. Maternal outcomes measured were pre-eclampsia, gestational diabetes, cesarean section rate, instrumental delivery, anemia, postpartum hemorrhage and fetal outcomes included small for gestational age and large for gestational age. The last menstrual period date was used to calculate the Gestational age and was confirmed by ultrasound. Multiple pregnancy, previous caesarean section and incomplete record were excluded from the study.

55-60% women in obese and mobidly obese were nulliparous respectively whereas elderly age women (21-30%) were more seen with overweight and obese women as compared to underweight or normal BMI groups (7-11%).

According to BMI, the frequency of antenatal complications had beenpresented in (table-II). Table-III shows the complication of pregnancy risk expressed as odd ratio in the various categories of BMI in comparison with the normal BMI.

The gestational diabetes (GDM) and pre-eclampsia showed linear relationship with increasing BMI. The adjusted Odds Ratio in the morbidly obese category for gestational diabetes and pre eclampsia is 10.0 (95% CI 3.5, 28.7) and 5.3 (95% CI 2.0, 14.1) respectively compared to those of standard BMI. On the otherside BMI >18.5kg/m^2 has adjusted odd ratio 0.31 (95% CI 0.11, 0.89) for pre-eclampsia and 0.18 (95% CI 0.02, 1.3) for gestational diabetes, seemed to have a shielding effect for development of these complication of preeclampsia and GDM.

Table-I: Maternal demographic characteristics in the various body mass index groups.

Variables	Underweight	Normal weight	Overweight	Obesity	Mobidly obese
Age (years)					
<19	10 (8%)	43 (8%)	05 (33%)	2 (2.2%)	1 (5%)
20-25	72 (55%)	254(47%)	79 (36%)	33 (37%)	4 (20%)
26-35	39 (30%)	184 (34%)	97 (44%)	36 (40%)	9 (45%)
>35	9 (7%)	59 (11%)	39 (18%)	19 (21%)	6(30%)
Parity					
Nulliparous	26 (20%)	183 (34%)	99 (45%)	49 (55%)	12(60%)
1-4	75 (58%)	259 (48%)	105 (48%)	31 (34%)	7 (35%)
>5	29 (22%)	98 (18%)	16 (7%)	10 (11%)	1 (5%)

Statistical analysis were done using SPSS version 21. Variables are presented as absolute frequency. The ANOVA for continuous variables and the chi-squared test for categorical variables were used to compare various groups. A p-value ≤0.05 were considered statistically significant. Logistic regression was used to adjust potential confounders. The complications risks of pregnancy wereexpressed as adjusted odd ratio with 95% confidence intervals.

RESULTS

This study included 1000 women whose complete information was present. Out of these 1000, 130 (13%) were underweight, 540 (54%) belonged to normal BMI, while 220 (22%), 90 (9%) and 20 (2%) women were from the overweight, obese and the morbidly obese categories respectively. The selected demographic characteristics of the women have been categorizedinto five groups according to their BMI as shown in table-I.

The labour induction risk is lower in underweight women {OR 0.8 (95% CI 0.55, 1.35)} and high in the morbidly obese {OR of 2.7 (95% CI 1.1, 6.8)}, showed the frequency of induction increased with increasing BMI. With increasing BMI, the occurrence of cesarean section either elective or emergency raised, in the overweight and obese group. The frequency of instrumental delivery was found more in overweight and obese group with OR 3.5 (95%CI 1.1, 11.2) and 2.4 (95% CI 0.4, 12.7). The risk of postpartum hemorrhage was found in extreme of BMI group with risk in underweight group is 1.92 (95% CI 0.6–5.6) and morbidly obese category is 2.5 (95% CI 0.31–20.6). The increasing trend of anemia was found in underweight group with adjusted relative risk 2.47 (95% CI 1.6–3.6). The risk of PPH in underweight seems to be due to anemia. Large for gestational age was seen more in morbidly obese with linear rise in frequency as weight increasing. As

compared to standard BMI, underweight category has more frequent small for gestational age with Odds Ratios of 4.6 (95% CI 2.6, 8.1).

The link between induced labour and ceasearean section with abnormal BMI was shown by many previous studies[12,13] and our study also agreed with this

Table-II: The frequency of obstetrics complications in body mass index group.

Pregnancy Complications	Under Weight	Normal Weight	Overweight	Obesity	Mobidly Obese	*p*-value
Anaemia	73 (56%)	184 (34%)	37 (17%)	11 (12%)	01 (7%)	0.002
Gestational Diabeties Mellitius	01 (1%)	22 (4%)	11 (5%)	09 (10%)	06 (30%)	<0.005
Preeclampsia	04 (3%)	49 (9%)	24 (11%)	12 (13%)	07 (32%)	0.001
Large for Gestational Age	01 (0.8%)	12 (2%)	18 (8%)	12 (13%)	4 (21%)	<0.005
Small for Gestational Age	27 (20.7%)	29 (5%)	15 (7%)	5 (6%)	11 (7%)	<0.005
Postpartum Hemorrhage	05 (4%)	11 (2%)	02 (1%)	02 (2.2%)	01 (5%)	0.36
Spontaneous Vaginal Delivery	113 (87%)	443 (82%)	158 (72%)	54 (5.3%)	6 (30%)	<0.005
Induced labour	31 (24%)	145 (27%)	72 (33%)	38 (42%)	10 (50%)	0.003
Ceasarian Section						
Emergency Ceasarian section	10 (8%)	42(7.7%)	25 (11.4%)	24 (26.6%)	7(35%)	<0.005
Elective Ceasarian section	6 (4.6%)	50 (9.2%)	30 (13.6%)	10 (11.1%)	7 (35%)	<0.005
Instrumental delivery	1 (0.8%)	5 (0.92%)	07 (3%)	02 (2.2%)	0	0.16

Table-III: Adjusted odds ratio of pregnancy complications in the abnormal body mass index groups compared to normal body mass index group.

Pregnancy Complication	Underweight	Overweight	Obese	Mobidly Obese
Anaemia	2.47 (1.6,3.6)	0.3 (0.26, 0.58)	0.256 (0.14, 0.510	0.10 (0.14,0.76)
Gestational Diabetis Mellitus	0.18 (0.02, 1.3)	1.23 (0.59, 2.6)	2.6 (1.16, 5.8)	10.0 (3.5, 28.7)
Preeclampsia	0.31 (0.11, 0.89)	1.27 (0.73, 2.05)	1.54 (0.78, 3.02)	5.3 (2.0, 14.1)
Large for Gestational Age	0.34 (0.04, 2.6)	3.9 (1.8, 8.2)	6.7 (2.9, 15.5)	11.0 (3.1, 37.8)
Small for gestational age	4.6 (2.6, 8.1)	1.28 (0.67, 2.4)	1.03 (0.39, 2.75)	21.5 (8.2, 56.0)
Postpartum Hemorrhage	1.92 (0.6, 5.6)	0.44(0.097-2.00)	1.09 (0.23, 5.0)	2.5 (0.31, 20.6)
Spontaneous Vaginal Delivery	1.31 (0.75, 2.2)	0.50 (0.3, 0.7)	0.28 (0.17, 0.45)	0.19 (0.08, 0.48)
Induced labor	0.86 (0.55, 1.35)	1.35 (0.96, 1.8)	2.0 (1.28, 3.21)	2.7 (1.1, 6.8)
Ceasarian Section				
Emergency Ceasarian section	0.47 (0.19, 1.13)	1.63 (1.0, 2.6)	1.63 (0.78, 3.4)	6.9 (2.4, 19.5)
Elective Ceasarian section	0.96 (0.46, 1.9)	1.65 (0.97, 2.8)	4.9 (2.8, 8.8)	4.8 (1.4, 16.4)
Instrumental delivery	0.82 (0.96-7.16)	3.5 (1.1-11.2)	2.4 (0.4-12.7)	0

DISCUSSION

This study suggests that not only the high body mass index, low BMI also predisposes women to adverse pregnancy outcomes.Our study has shown a linear relationship of having pre-eclampsia, gestational diabetes, and risk of emergency caesarean section with obesity (high BMI).

Obesity is a risk factor for development of gestational hypertension and gestational diabetes as indicated by logistic regression analysis in this study. Similar association of increased BMI with development of hypertension and hyperglycemia had been observed in various studies[9,10]. A meta analysis[11] emphasized that with each 5-7 kg/m² increase in BMI, the risk of pregnancy induced hypertension magnified. We analysed the risk of pre-eclampsia 3 and 7 times higher in obese and morbidly obese women respectively, whereas underweight women havea remarkably lower risk of preeclampsia {OR 0.31(95% CI 1.11-0.89)}.

association. The obesity increased the risk of emergency ceasarean section whereas the rate of spontanoes labour is low with increased BMI. The increased BMI carried high risk of perioperative morbidity like anaesthetic problems, infections and prolonged hospitalization. The risk of postpartum hemorrhage is more with obese women in our study which was similar with the studies of Butwick[14]. According to this cohort study overweight and obese women had up to 19% increased risk of hemorrhage. The risk of anemia increased with underweight BMI as expressed by cohort study od Indonesia[15], which is similar with our study.

We found strong relationship between BMI and fetal weight. The risk of small for gestational age was higher in underweight group, while the large for gestational age (macrosomia birth weight more than 4.5 kg) was greater in the BMI above 30. The association of maternal obesity with fetal growth has been established by many studies[16,17] and they expressed that 18-

26% increased risk of having an infants with macromic baby without gestational diabetes[18].

The strength of our study is that it is single centre study with women belonging to multiethnic and varied socio-economic strata. Being the single centre study cutdown the effects of variation in clinical practice and its effects on outcome. This study has several limitations like any other observational study. Prepregnancy BMI should be ideal for evaluation is one of the limitations. In our study we included all those women who registered before 16 weeks inorder to minimize the effects of gestational weight gain. The other limitation of this study was its retrospective nature, due to which some of the socio-demographic details such as level of education, socio-economic status could not be assessed.

CONCLUSION

The present study suggests that half of the women embark on pregnancy with abnormal BMI. Women having abnormal weight are at risk of pregnancy complication which includes preeclampsia, gestational diabetes, caesarean section rate, labor induction and macrosomic babies with obesity while anemia and small for getational age for underweight BMI. So emphasis should be given to pre pregnancy weight reduction, nutritional education and life style modification to improve pregnancy outcomes.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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