Original Article

Is There a Link Between High Body Mass Index and Poor Perinatal Outcome in Primiparas?

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Abstract

Objective: To determine the link between high body mass index (BMI) and poor perinatal outcomes.
Methodology: This prospective observational study was conducted in the department of obstetrics and Gynaecology, Military hospital, Rawalpindi between 1st January to 31st October 2017. A predesigned questionnaire proforma collected demographic data, obstetric and perinatal outcomes. Chi square and multivariate logistic regression analysis were used for comparison of data.
Results: Of the 395 samples included in the study, 49% had normal BMI, 34% were overweight and 16% were obese. Out of these, 50.5% of samples had age between 26-35 years, the mean age(±S.D) was 25.80(±3.5), 92.7% were Punjabi and 73.4% of samples were from middle socioeconomic status. High BMI had a significant association with GDM, hypertensive disorders of pregnancy, anemia, pulmonary embolism and deep vein thrombosis (DVT), and mode of delivery. There was no statistically significant difference in frequency of PPH, placenta praevia, placental abruption, and any other intrapartum complication with BMI. There was a decrease in the incidence of induction of labor and instrumental delivery in obese women. A statistically significant increase in the incidence of low apgar score at one minute, birth weight >4 kg, need for resuscitation and admission in NICU was associated with obesity.
Conclusion: High BMI has an association with poor perinatal outcomes. With good care, obesity may marginally effect perinatal outcomes but greatly increases the burden of GDM, hypertensive disorders of pregnancy, anemia, hospital admissions, thromboembolism and NICU admissions.
Keywords: Obesity, BMI, pregnancy, perinatal outcomes

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Introduction

Obesity in pregnancy has doubled in the UK from 7.6 to 15.6% over a 19-year period.[1] The maternal, fetal, peripartum, and neonatal complications of obesity in pregnancy have far-reaching implications for both mother and offspring. Indeed, it is now considered that it is superseding other more important healthcare issues which include undernutrition and infectious diseases which are the major contributors of sickness.[2] More than 30% of the antenatal population in the UK is affected by obesity and is the most common condition negatively

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affecting pregnancy.[2] Obesity harms pregnancy outcome and an increase in inpatient costs remains statistically significant after adjusting for both socio-demographic factors and clinical complications associated with body mass index (BMI). Other studies looked at the financial implications of obesity in terms of frequency of antenatal visit, hospital admissions and management of resultant complications.[3]

Healthcare professionals which are involved in care of the women in pregnancy feel that maternal obesity has major consequences for service delivery.

This impact has an association with economic costs, need of extra care to be given to the mother and baby due to the complications of pregnancy, problems to carry out some procedure, and effect on psychological health of the patient.

To note, there is an increasing trend of obesity amongst adolescents and this cycle of obesity has far-reaching consequences in future generations. Some health care professionals feel that there are no national guidelines or local policies to center the care of such women in pregnancy. So, such issues raised in this study also deserve further research.[4] The budget of the NHS of the care of obese women in pregnancy is also an unexplored topic in the UK.[5]Obesityleads to a dose-dependent increase in the development of many complications, including hypertension (HTN), pregnancy-induced hypertension (PIH), pre-existing diabetes (DM), gestational diabetes (GDM), other maternal illnesses, induction of labour (IOL), emergency and elective caesarean section (Em. LSCS & El. LSCS), admission to the neonatal intensive care unit (NICU), and iatrogenic preterm birth, with increasing maternal BMI.[4] The purpose of this study was to determine the effect of maternal pre-pregnancy obesity on multiple antepartum, intra-partum and neonatal outcomes. Some studies also incorporated pre-pregnancy history of diabetes and hypertension while we excluded these from our study. We took only primiparas of relatively younger age group to exclude the effect of age and multiparity which are leading confounders in previous studies. The association between multiparity and obesity is linear. Many studies have also included low BMI for comparison. We wanted to spotlight obesity in pregnancy and focus on its impact.

Methodology

After taking ethical approval from the hospital's ethical committee, this prospective observational study was conducted in the department of Obstetrics and Gynaecology Military hospital, Rawalpindi from 1st January to 31st October 2017.

Inclusion criteria: Primigravidas, between 20-35 years of age, and normal, overweight or obese women. BMI before 18 weeks of gestation was noted from the antenatal record as women were inducted after reviewing the antenatal record based on weight at gestation less than 18 weeks.

However, underweight women, those with pre-pregnancy diabetes/diabetes during 1st trimester/HTN and those with known congenital fetal anomalies were excluded. Those women who had no antenatal record of early pregnancy were also excluded from the study. There were only 2 cases of morbid obesity so we decided to eliminate that from the study and morbid obesity was part of exclusion criteria.

Classification of maternal BMI: According to World Health Organization: underweight(<18.5kg/m2), normal weight (18.5–24.9kg/m2), overweight (25.0–29.9kg/m2) and obese (Class I and II obesity 30–39.99kg/m2; Class III obesity ≥40.0 kg/m2).

All the admitted women in the obstetric or labour ward for delivery and fulfilling the inclusion criteria were enrolled in the study. A questionnaire proforma was designed after an extensive literature review. After explaining the objectives of the study, verbal informal consent was taken for inclusion in the study. A trainee researcher collected demographic data of the study participants and these women were followed for perinatal outcomes.

The demographic profile included age, BMI, ethnicity like punjabi/hindko/pushto/saraiki/Kashmiri/sindhi/other, perceived socioeconomic status i-e lower/middle/higher, gestational age (GA):>37 weeks, 32-36+6 weeks, 28-31+6 weeks, <28 weeks and any fetal risk factors like oligohydramnios+-intrauterine growth restriction (IUGR) /polyhydramnios / intrauterine death (IUD)/ others.

Obstetrical outcomes [gestational diabetes (GDM), hypertensive disorders of pregnancy, anaemia, placenta praevia, placental abruption, pulmonary embolism and deep vein thrombosis (DVT)] and intrapartum outcomes [IOL, mode of delivery (MOD) i-e spontaneous vaginal delivery (SVD)/Instrumental delivery/ Em.LSCS/El.LSCS, any intrapartum complications & postpartum haemorrhage (PPH)] were also recorded in the questionnaire.

Neonates of these women were followed till discharge from the hospital and the final diagnosis of neonatal complications was made by the neonatologist. Neonatal outcomes included apgar score, birth weight, need for resuscitation, neonatal admission, any fetal complications like hypoglycemia/respiratory distress syndrome (RDS)/sepsis/seizures/early neonatal death (ENND) /other.

Data were stored and analyzed using statistical package for social sciences (SPSS) version 23.0. Count and percentages were computed for demographic profile and perinatal outcomes. Pearson chi-square test was used to analyze the association of various parameters with BMI. Logistic regression analysis was applied to remove effect of confounders like ethnicity, age and socioeconomic class. P-value less than 0.05 were considered statistically significant.

Results

Out of 603 Primiparas who delivered in our labour ward, 398 met the inclusion criteria and 395 were analysed as 3 were lost to follow up. Out of 395 study samples,49% had normal BMI, 34% were overweight and 16.5 % were obese.

Figure I show that 50.5% samples had a age between 26-35 years, the mean age(±SD) was 25.80(±3.5), 49.6% samples had a body mass index between 18.5-22.9 kg/m^2, 92.7% were Punjabi and 73.4% samples were from middle socio economic status.

Results showed that BMI had a significant association with GDM, hypertensive disorders of pregnancy, anemia, pulmonary embolism and DVT, and mode of delivery.

Higher percentages of these parameters were observed with higher BMI. A linear dose dependent escalation with obesity was noted in GDM from 0.5% through 2% to 6.2%, for hypertensive disorders from 5.1% through 9.7% to 23%. Pulmonary embolism/DVT from 0 to 0.7% to 6.2%, caesarean section from 43% through 49% to 72%. A statistically significant difference was demonstrated in all the above parameters. There was no statistically significant difference in frequency of PPH, placenta praevia, placental abruption and any other intrapartum complication. There was a decrease in the incidence of induction of labor and instrumental delivery. (Table I)

Apgar score at 1 min and neonatal admission gives a significant association with BMI. A Lower Apgar score at 1 min was observed among the higher BMI group. There was a statistically significant increase in neonatal admission but it did not translate into any increased neonatal death. There was an increase in macrosomic babies but it did not reach statistical significance. There was a statistically significant increase in the incidence of low apgar score at one minute, birth weight >4 kg, need for neonatal resuscitation and admission in NICU with increasing BMI. There was also an increased risk of low apgar at 5 min and other neonatal complications but it did not touch statistical significance. (Table II)

Discussion

The percentage of women with BMI>30kg/m^{2}was 16.5% in our study. The data from other countries have shown a percentage of 3.8% in Japan, 22.8% in the UK and 33.4% in the USA.

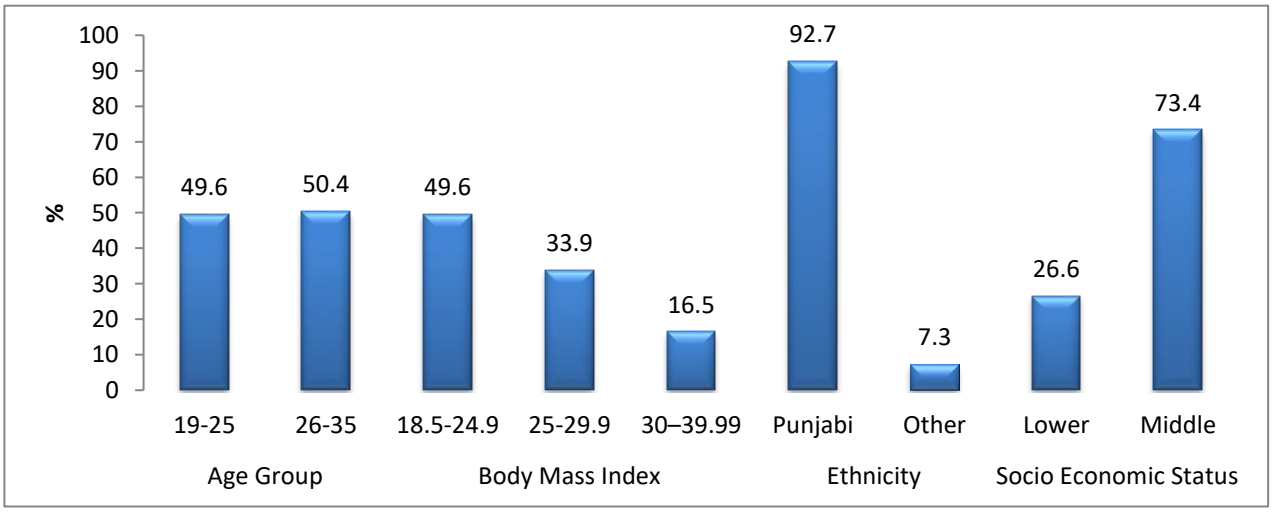

Figure I. Baseline characteristics of studied samples (n=395)

Table I: Association of obstetric parameters with BMI

Parameters		Body Mass Index (kg/m2)						p-value
		18.5-24.9 (n=196)		25-29.9 (n=134)		30–39.99 (n=65)		
		n	%	n	%	n	%	
GDM	Yes	1	0.5	3	2.2	4	6.2	0.019*
	No	195	99.5	131	97.8	61	93.8	
Hypertensive disorders of pregnancy	Yes	10	5.1	13	9.7	15	23.1	<0.01*
	No	186	94.9	121	90.3	50	76.9	
Anemia	Yes	3	1.5	1	0.7	4	6.2	0.031*
	No	193	98.5	133	99.3	61	93.8	
Placenta praevia	Yes	1	0.5	1	0.7	1	1.5	0.71
	No	195	99.5	133	99.3	64	98.5	
Placental abruption	Yes	1	0.5	0	0.0	0	0.0	0.60
	No	195	99.5	134	100.0	65	100.0	
Pulmonary embolism and DVT	Yes	0	0.0	1	0.7	4	6.2	<0.01*
	No	196	100.0	133	99.3	61	93.8	
IOL	Yes	110	56.1	65	48.5	24	36.9	0.02*
	No	86	43.9	69	51.5	41	63.1	
MOD	SVD	84	42.9	40	29.9	6	9.2	<0.01*
	Instrumental Delivery	10	5.1	3	2.2	1	1.5	
	Em. LSCS	80	40.8	66	49.3	47	72.3	
	El . LSCS	22	11.2	25	18.7	11	16.9	
Any intrapartum complications	Yes	48	24.5	30	22.4	17	26.2	0.82
	No	148	75.5	104	77.6	48	73.8	
Postpartum hemorrhage	Yes	2	1.0	1	0.7			0.71
	No	194	99.0	133	99.3	65	100.0	

A p value of <0.05 was considered statistically significant

Table II: Association of neonatal parameters with BMI

Parameters		Body Mass Index (Kg/m2)						p-value
		18.5-24.9 (n=196)		25-29.9 (n=134)		30–39.99 (n=65)		
		n	%	n	%	n	%	
APGAR score 1min	>7	142	72.4	90	67.2	36	55.4	0.01*
	4-7	47	24.0	41	30.6	22	33.8	
	<4	7	3.6	3	2.2	7	10.8	
APGAR score 5min	>7	186	94.9	129	96.3	59	90.8	0.058
	4-7	5	2.6	2	1.5	0	0.0	
	<4	5	2.6	3	2.2	6	9.2	
Birth weight	<2.5	37	18.9	24	17.9	14	21.5	0.77
	2.5-4	152	77.6	106	79.1	47	72.3	
	>4	7	3.6	4	3.0	4	6.2	
Need for resuscitation	Yes	3	1.6	2	1.5	2	3.4	0.62
	No	189	98.4	130	98.5	57	96.6	
Neonatal admission	Yes	55	28.6	54	40.9	25	42.4	0.03*
	No	137	71.4	78	59.1	34	57.6	
Any neonatal complication	Hypoglycemia	0	0.0	0	0.0	0	0.0	0.49
	RDS	2	25.0	1	9.1	0	0.0	
	Sepsis	0	0.0	2	18.2	0	0.0	
	Seizures	0	0.0	0	0.0	0	0.0	
	Death	3	37.5	2	18.2	0	0.0	
	Other	3	37.5	6	54.5	2	100.0	

*p<0.05 was considered significant using Pearson chi square test

Obesity seems to be a global epidemic.[4,6] Around 32% of the women of reproductive age are overweight and 21% are obese.

Obesity has a negative impact on pregnancy outcomes. While many studies in the past have stratified the results by mild and severe obesity in the past, we have put these groups under one heading of obese group.[5,6,7]. A study has been conducted in the UK, which showed that obese women are 3.6 times more likely to develop diabetes as compared to women with normal weight.[5]Obese pregnant women were significantly more prone to have gestational diabetes (RR 6.35). The adjusted odds ratio (OR) for the risk of GDM was 2.6 for obese and 4.0in a large Danish study consisting of 8092 women, the odds of developing GDM also increased with BMI.[6]In a

Spanish study, both pre-pregnancy maternal BMI and gestational hyperglycemia are independent risk factors for diabetes-related adverse pregnancy outcomes.[7] We excluded all women with pre-pregnancy and 1st trimester diabetes to exclude this confounder. However, pre-pregnancy BMI has a much stronger population impact than abnormal glucose tolerance categories, due to its higher prevalence.[7]Similar findings were replicated in our study.

Antepartum hemorrhage was a common finding amongst obese women (RR 3.14). This finding was at variance with our study and we found no such involvement. Possibly it was because we only targeted primiparas. Increased birth weight of the babies were more common among obese women (RR 9.1). In an Egyptian study that is divergent from our study,[8] hypertensive disorders with worsening results were 9 times more common among obese women (RR 4.74). The same trend was replicated in our study.

Other risks to the mother demonstrated in our study include an undeviating increased risk of preeclampsia which was doubled in our study. In many other studies, this risk is more than triple[11] which includes an increased risk of proteinuric hypertension and thromboembolic phenomena. In the North West Thames study,0.04% of the normal weight women had thromboembolism, 0.07% in the overweight and 0.08% in the obese women. Though generally there is an impression that these disorders are rare in our part of the world but all cases of thromboembolism belonged to the overweight/obese group during the study period. It is to be noted that none of these women in our study received thromboprophylaxis as they would have in a western setup. Even obese women were more prone to develop anemia as compared to non-obese women (RR 3.84).

Fetus is also at increased risk of morbidity and mortality in large population-based studies (1.4 per1000 versus 5.7 per 1000 in the obese group).[9,14] We did not demonstrate any such risk in our group which may be due to smaller size of the study. Moreover, increased birth weight of the babies was very common amongst obese (RR 9.1). Macrosomia>90th centile was 9 versus 17.5% in the obese group in other studies[11].As we targeted only primiparas, there were less confounders in our study to study the pure effect of obesity on pregnancy outcomes. Macrosomia was also increased but it did not touch statistical significance.

Another complication established in literature is an increase in instrumental deliveries amongst overweight and obese women. Our study group targeted women from lower socioeconomic class, unlike international studies where about 50% of their study population was overweight or obese and belonged to more affluent class.

Antepartum hemorrhage has also a significant association with obese women (RR 3.14). In our cohort of primis, we could not display any such risk even though the study was adequately powered.[5,13] Majority of these women were young around 50% < 25 years and no patient was >35 years. Our study did not exhibit such a risk.

There is no evidence based information related to any link between obesity and congenital malformations. Literature has shown an association of obesity with increased risk of antepartum stillbirth.[12]We did not establish any such risk in this group where only pimiparas in low socioeconomic groups were challenged.

Obese women had an escalating rate of induction of labour[13]. In our study induction rates were not increased. Maybe a lot of these women were straight away booked for caesarean section leading to a higher risk of elective cesarean section rate. Due to, perhaps, technical difficulty in instrumental deliveries they were not offered instrumentation.[8]Past studies demonstrate a higher rate of failed induction but this was not evaluated in our study.

A growing rate of both elective (11 versus 19%) and emergency caesarean section (40% versus 72%) was observed which were almost twice as high as displayed in past studies[13,14]in obese women as compared with the normal BMI group. Other studies focused on postoperative febrile morbidity and wound infection but this was not in the domain of our study. Maternal obesity is also associated with operative delivery.[15] The same trend was mirrored in our study where background caesarean section rates were very high as our center is the main referral center for other regional hospitals.

Other studies looked at the financial implications of obesity in terms of frequency of antenatal visits, hospital admissions and management of complications.[14] This was not in the domain of our study and we could not confirm this association.

The following are recommendations for management of obesity in pregnancy:

- At booking, check BMI of all patients.[16,17 18]
- Advise should be given on risks.
- Dietary advice should be given to all women

according to their BMI.

- Suggest dietary modification but not weight loss.

Strengths of our study: While international studies have targeted both primi and multiparas, our study has only targeted primiparas. Multiparity has a linear association with obesity and is a strong confounder that was eliminated. Age, ethnicity and social class are other confounding factors. Around 90% had same social class and ethnicity. All three confounders were dealt with by regression analysis to eliminate bias. Many studies on BMI are retrospective. In our study women were inducted in labour after reviewing antenatal record based on weight at gestation less than 18 weeks. With this study design, un-booked were excluded as it is also a confounding factor. Low BMI and those without a record were also excluded. We also excluded pre-pregnancy and 1st trimester hypertension and diabetes from our study. Those with normal and high BMI were included and followed till discharge of mother and baby from the hospital.

Limitations of the study: Some studies have also incorporated weight gain in pregnancy in addition to BMI as a determinant of obstetric outcome while we did not incorporate that.

Conclusion

High BMI is associated with poor perinatal outcomes. With good care obesity may marginally effect perinatal outcomes but greatly increases the burden of GDM, hypertensive disorders of pregnancy, anemia, hospital admissions, thromboembolism and NICU admissions.

Women should be encouraged to reduce weight before pregnancy. All overweight women should be screened for GDM, regular antenatal visits should be advised with blood pressure checks, prophylaxis should be given for thromboembolism and weight loss should be suggested before next pregnancy.

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