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STUDY TO ANALYSE INDEPENDENT ASSOCIATION BETWEEN ABNORMAL BMI AND OBSTETRIC CO-MORBIDITIES

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Abstract

Background: Obesity causes major changes in maternal intermediary metabolism & these women are more prone to preeclampsia, gestational diabetes, operative vaginal Deliveries & caesarean deliveries. Present study was aimed to analyse independent association between abnormal BMI and obstetric co-morbidities at a tertiary hospital. **Material and Methods:** Present study was single-center, prospective, observational study, conducted in pregnant women with singleton pregnancies attending antenatal clinic at our hospital in first trimester, planning to deliver at the same hospital. Pregnant women were placed in standard BMI categories and the obstetric outcome variables were evaluated. **Results:** During the study period 200 patients were observed. Out of them 85(42.5%) fall in normal Body mass index (BMI), 33(16.5%) fall in underweight category, 63(31.5%) fall in overweight category & 19(9.5%) fall in obese group. Majority of the LSCS (57.9%) were from obese group. Majority of vaginal deliveries (90.9%) were from underweight group. ($P \leq 0.001$, highly significant). The incidence of GDM was highest in obese group (42.1%) ($P \leq 0.001$, highly significant) Preeclampsia rate was highest in obese group (26.3%) followed by overweight group (15.87%) (P=0.078). Increased rate of LSCS (41.5%) was associated with high BMI group when compared with normal group (22.4 %) & in underweight group (9.1%) (P=0.001, highly significant). Majority of vaginal deliveries (90.9%) were from underweight group. Rate of preeclampsia was increased in high BMI group (18.3 %) when compared with normal group

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 03, 2024

(7 %) & underweight group (9 %) (P=0.071). Rate of GDM was significantly raised in high BMI group (14.6%) compared to normal (3.52%) & underweight group (3%) (P=0.015). The highest number of postpartum infection 7.3% were from High BMI group when compared with 2.4% from normal BMI group. (P=0.277). **Conclusion:** Obesity is associated with increased incidence of caesarean delivery, Gestational diabetes, preeclampsia, postpartum infection, and induction of labour.

Keywords: abnormal BMI, pregnancy, obesity, caesarean delivery, Gestational diabetes, preeclampsia, postpartum infection

Introduction

The World Health Organization (WHO) describes obesity as one of the most blatantly visible, yet most neglected, public health problems that threatens to overwhelm both more &less developed countries. Marked obesity is unequivocally hazardous to the pregnant women and her foetus. Obesity causes major changes in maternal intermediary metabolism & these women are more prone to preeclampsia, gestational diabetes, operative vaginal Deliveries & caesarean deliveries.[1,2]

Unhealthy weight increases the risk of many health conditions including hypertension and diabetes, and avoiding the subject of unhealthy weight gain misses an opportunity to possibly prevent or treat many weight related illness.[3,4] Women with increased BMI are more prone to postoperative wound infections, endometritis & subfertility due to increased insulin resistance. In addition, maternal obesity substantially increases a child's risk of being overweight. Offsprings of obese mothers are at increased risk of neural tube defects, macrosomia, neonatal death and morbidity associated with subsequent childhood obesity.[5] The incidence of obesity complicating pregnancy is now 18-38% of all pregnancies. [6,7]

On the contrary, in developing countries like India we also have a problem of low BMI because of high prevalence of malnutrition. Pregnancies in women with low BMI also is known to be associated with increased risk of preterm deliveries and low birth weight. However, it has also shown to have reduction in other pregnancy complications like preeclampsia, diabetes and obstetric interventions.[8] Present study was aimed to analyse independent association between abnormal BMI and obstetric co-morbidities at a tertiary hospital.

Material And Methods

Present study was single-center, prospective, observational study, conducted in department of Obstetrics & Gynaecology, Princesses Durru Shehavar Children's & General Hospital, Hyderabad, India. Study duration was of 1 year (March 2014 to March 2015). Study approval was obtained from institutional ethical committee.

Inclusion criteria

- All pregnant women with singleton pregnancies attending antenatal clinic at our hospital in first trimester, planning to deliver at the same hospital, willing to participate in present study

Exclusion criteria

- Women with multiple pregnancies.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 03, 2024

- Women with chronic diseases.
- Women with previous caesarean section.

Study was explained to patients in local language & written consent was taken for participation & study. A detailed history regarding name, age, obstetric score was taken. Estimated gestational age were calculated based on the recalled LMP or USG studies. Baseline weight and height were recorded during the initial visit in the first trimester and the basal BMI was calculated using the formula weight in kilograms divided by height in meters squared [kg/m^2].

The outcome variables evaluated were pre-eclampsia, gestational diabetes, caesarean delivery, IUGR, failed induction, operative vaginal deliveries, postpartum infection & birth weight. Pregnant women were placed in standard BMI categories and the obstetric outcome variables were evaluated. BMI classification followed as;

- Underweight <18.5
- Normal weight 18.5-24.9
- Overweight 25-30
- Obese >30

Data was entered in Excel and the analysis was done using SPSS version 17. Continuous variables were reported using mean and S.D for the normally distributed variables otherwise median and inter-quartile range. Categorical variables were using number and percentages. Chi-square test was done to find the association between the BMI categories and the outcome variables. Independent t test was done to compare the overweight/obese, underweight with normal BMI category. ANOVA was done to compare the means of all the three groups of BMI categories. P value less than 0.5 was considered as statistically significant.

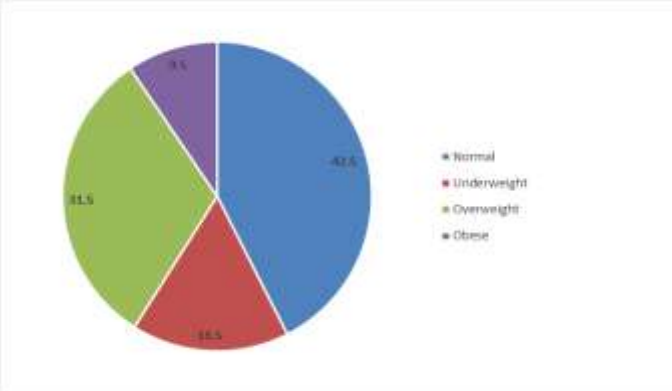
Results

During the study period 200 patients were observed. Out of them 85(42.5%) fall in normal Body mass index (BMI), 33(16.5%) fall in underweight category, 63(31.5%) fall in overweight category & 19(9.5%) fall in obese group.

Table 1: Body mass index (BMI)

BMI cat	No. of patients	Percentage
Normal	85	42.5
Underweight	33	16.5
Overweight	63	31.5
Obese	19	9.5

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 03, 2024



Figure

Majority of the LSCS (57.9%) were from obese group. Majority of vaginal deliveries (90.9%) were from underweight group. (P≤ 0.001, highly significant). The incidence of GDM was highest in obese group (42.1%) (P≤ 0.001, highly significant) Preeclampsia rate was highest in obese group (26.3%) followed by overweight group (15.87%) (P=0.078).

Table 2: Study variables in each BMI categories

Variable	Normal	Underweight	Overweight	Obese	P Value
Mode of delivery					
Vaginal	66(77.6)	30(90.9)	40(63.5)	8(42.1)	<0.001
LSCS	19(22.4)	3(9.1)	23(36.5)	11(57.9)	
Term/Preterm					
Term	80(94.1)	31(93.9)	59(93.6)	17(89.4)	0.9
Pre term	5(5.9)	2(6.1)	4(6.4)	2(10.6)	
Preeclampsia	6(7.0)	3(9.0)	10(15.87)	5(26.3)	0.078
Instrumental delivery	81(95.3)	31(93.9)	60(95.24)	18(94.7)	
GDM	3(3.5)	1(3.0)	4(6.3)	8(42.1)	<0.001
Postpartum infection	2(2.4)	1(3.0)	4(6.3)	2(10.5)	0.368
Failed induction	4(4.7)	1(3.0)	3(4.8)	2(10.5)	0.819
IUGR	3(3.5)	1(3.0)	2(3.2)	2(10.5)	0.508

Increased rate of LSCS (41.5%) was associated with high BMI group when compared with normal group (22.4 %) & in underweight group (9.1%) (P=0.001, highly significant). Majority of vaginal deliveries (90.9%) were from underweight group. No significant difference was found for preterm& term deliveries in different BMI categories. (p=0.927) Rate of preeclampsia was increased in high BMI group (18.3 %) when compared with normal group (7 %) & underweight group (9 %) (P=0.071).

4.87% of Instrumental deliveries were from High BMI group,4.7% from normal group and 6.1% from underweight group. (P=0.954) Rate of GDM was significantly raised in high BMI group (14.6%) compared to normal (3.52%) & underweight group (3%) (P=0.015). The highest number of postpartum infection 7.3% were from High BMI group when compared with 2.4% from normal BMI group. (P=0.277). 10.5% of failed induction were from obese group & 4.8% from overweight group. (P=0.819).

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 03, 2024

Table 3: Study variables between normal group, underweight & high BMI groups.

Variable	Normal	Underweight	High BMI	P Value
Mode of delivery				
Vaginal	66(77.6)	30(90.9)	48(58.5)	<0.001
LSCS	19(22.4)	3(9.1)	34(41.5)	
Term/Preterm				
Term	80(94.1)	31(93.9)	76(92.7)	0.927
Pre term	5(5.9)	2(6.1)	6(7.3)	
Preeclampsia	6(7.0)	3(9.0)	15(18.3)	0.071
Instrumental delivery	4(4.7)	2(6.1)	4(4.87)	0.954
GDM	3(3.5)	1(3.0)	12(14.6)	0.015
Postpartum infection	2(2.4)	1(3.0)	6(7.3)	0.277
Failed induction	4(4.7)	1(3.0)	5(6.1)	0.993
IUGR	3(3.5)	1(3.0)	4(4.9)	0.865

Only 9.1% of women underwent LSCS, compared to 22.4% in normal group.

Table 4: Study variables between normal BMI group & underweight group

Variable	Normal	Underweight	P value
Mode of delivery			
Vaginal	66(77.6)	30(90.9)	NS
LSCS	19(22.4)	3(9.1)	
Term/Preterm			
Term	80(94.1)	31(93.9)	NS
Pre term	5(5.9)	2(6.1)	
Preeclampsia	6(7.0)	3(9.0)	NS
Instrumental delivery	4(4.7)	2(6.1)	NS
GDM	3(3.5)	1(3.0)	NS
Postpartum infection	2(2.4)	1(3.0)	NS
Failed induction	4(4.7)	1(3.0)	NS
IUGR	3(3.5)	1(3)	NS

Increased rate of LSCS (41.5%) was associated with high BMI group when compared with normal group (22.4 %) & in underweight group (9.1 %) (P=0.007, highly significant). Rate of preeclampsia was increased in high BMI group (18.3 %) when compared with normal group (7 %) & underweight group (9%) P=0.028

Table 5: Study variables between normal weight group & High BMI group.

Variable	Normal	High BMI	P value
Mode of delivery			
Vaginal	66(77.6)	48(58.5)	0.007
LSCS	19(22.4)	34(41.5)	
Term/Preterm			
Term	80(94.1)	76(92.7)	0.71

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 03, 2024

Pre term	5(5.9)	6(7.3)	
Preeclampsia	6(7.0)	15(18.3)	0.028
Instrumental delivery	4(4.7)	4(4.87)	0.95
GDM	3(3.5)	12(14.6)	0.011
Postpartum infection	2(2.4)	6(7.3)	0.134
Failed induction	4(4.7)	5(6.1)	0.918
IUGR	3(3.5)	4(4.9)	0.666

When normal group compared with obese group, the rate of GDM was 42.1%, (P=0.001, highly significant). Rate of caesarean delivery, 57.9 % in obese, 22.4 % in normal group (P=0.01 highly significant).

Table 6: Comparison of variables between normal BMI group & obese group.

Variable	Normal	Obese	P Value
Mode of delivery			
Vaginal	66(77.6)	8(42.1)	0.01
LSCS	19(22.4)	11(57.9)	
Term/Preterm			
Term	80(94.1)	17(89.47)	NS
Pre term	5(5.9)	2(10.6)	
Preeclampsia	6(7.0)	5(26.3)	0.05
Instrumental delivery	4(4.7)	1(5.3)	NS
GDM	3(3.5)	8(42.1)	0.001
Postpartum infection	2(2.4)	2(10.5)	NS
Failed induction	4(4.7)	2(10.5)	NS
IUGR	3(3.5)	2(10.5)	NS

Incidence of GDM in obese was 42.1% when compared with 6.3% in overweight group (P=0.001, highly significant).

Table 7: Comparison of study variables between overweight group & obese group.

Variable	Overweight	Obese	P Value
Mode of delivery			
Vaginal	40(63.5)	8(42.1)	NS
LSCS	23(36.5)	11(57.9)	
Term/Preterm			
Term	59(93.6)	17(89.4)	NS
Pre term	4(6.4)	2(10.6)	
Preeclampsia	10(15.87)	5(26.3)	NS
Instrumental delivery	3(4.76)	1(5.3)	NS
GDM	4(6.3)	8(42.1)	0.001
Postpartum infection	4(6.3)	2(10.5)	NS
Failed induction	3(4.8)	2(10.5)	NS
IUGR	2(3.2)	2(10.5)	NS

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 03, 2024

Discussion

Obese women unequivocally have reproductive disadvantages. As expected, this study adds to the increasing body of evidences which suggests that obesity measured by BMI, predisposes women to complicated pregnancies and increased obstetric interventions. We found a linear relationship between increasing body mass index and the risk of developing pre-eclampsia, gestational diabetes, failed induction and emergency caesarean section. Conversely, low BMI had a protective effect on some obstetric complications & had a better pregnancy outcome than women with normal BMI.

The food habits and sedentary lifestyle changes could result in weight gain. Obesity in pregnancy is also associated with increased health-care utilisation and costs.[9] In our study also, obese women require frequent admissions in hospital. We are in concurrence with earlier reports which have shown an association between increasing BMI and interventions like induced labour and caesarean delivery.[10,11]

When compared with a normal pregravid BMI, the risk of caesarean delivery was higher in high BMI women. It was highest in obese compared with overweight (57.9% vs 36.5% and P=<0.001). Similar results were reported by Vaharatian[12],the adjusted relative risk for caesarean delivery among overweight women was 1.2(95%CI 0.8-1.8) and obese women1.5(95%CI 1.05-2.0) .Weiss et al.,[13] reported the rate of caesarean section among nulliparous women to be 20.7% for normal-weight women, 33.8 % for class 1 obese, and 47.4 % for class 2 obese patients.

In comparison with women of BMI 18.5 – 24.9, high BMI women faced the highest risk of GDM and underweight women the lowest. The incidence of GDM was 14.6% in women with High BMI compared to 42.1% in Obese women (P=<0.001). This is in agreement with Sabire NJ et al.,[14] who found a Two-fold increase in the rate of GDM (OR1.68;95%CI 1.53-1.84). Kumari et al.,[15] comparing obese and nonobese patients, found a rate of GDM of 24.5% for the obese and 2.2%for the nonobese. And Bianco et al.,[16] reported a threefold in GDM for obese patients. The risk of GDM is positively correlated with increasing BMI.

Earlier studies have shown an association between increasing BMI and preeclampsia. Bianco et al.,[16] conducted a retrospective cohort study of 613 obese women and 11313 nonobese women. A fourfold increased risk for preeclampsia was reported in obese women. Kumari et al.,[15] evaluated 159 obese women & 300 non obese women and concluded that a BMI greater than 40 was associated with hypertensive disorder of pregnancy in 28.8% compared with 2.9%in the non-obese women.

Our study also showed positive association of raised BMI and preeclampsia. A meta-analysis of the risk of pre-eclampsia associated with maternal BMI showed that the risk of pre-eclampsia doubled with each 5 to 7 Kg/m^2 increase in prepregnancy BMI. We found a 2&1/2 times higher risk of pre-eclampsia in high BMI ($BMI>25kg/m^2$).[17]

Some previous work has also demonstrated a strong link between postpartum blood loss and BMI. Although we found a linear increase in mean postpartum blood loss with increasing BMI, the risk of postpartum haemorrhage, was not significant here. Other studies have reported conflicting results. While Sebire et al.,[14] observed a 70% increase in postpartum

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 03, 2024

haemorrhage, Bianco et al.,[16] found no such difference in the incidence. The incidence of failed induction among high BMI group was 6.1% compared with 4.7% in normal BMI group. In obese alone it was 10.5%. In support of this Sheiner et al.,[18] found that obese women were more likely to have labour induction, failure to progress during the first stage of labour, malpresentations and cesarean section than non-obese women.

The incidence of IUGR was highest in, obese (10.5%). However, this study and the study by Cedergren[19] shows that after excluding women with preeclampsia the increased risk of IUGR with obesity was no longer statistically significant (adjusted OR1.2;95%CI0.94-1.60)

Even though it was not statistically significant, the incidence of postpartum infection was increased (7.3%) in high BMI group compared with normal BMI group(2.4%).And this is in consistent with study by Martens et al.,[20] that obesity, prolonged rupture of membranes, emergency caesarean section were all risk factors for postpartum infection. In agreement with Johnson et al.,[21] that obesity cause increased incidences of prolonged second stage and operative vaginal deliveries, but the current study showed not increased risk of instrumental delivery in high BMI group 4.87%, when compared with 4.7% in normal BMI group, because of other risk factors most of patient and doctors prefer emergency caesarean section to avoid foetal compromise.

Krishnamoorthy et al.,[22] suggest that all pregnancies in obese women be acknowledged as high risk and managed according to strict guidelines. Management should include pre-pregnancy counselling to reduce weight; shared antenatal care and appropriate management of complications. The evidence for obesity as an important complication in pregnancy is mounting. It is time to inform practice based on this evidence.

Although we are becoming more aware of the serious consequences imposed by obesity on pregnancy, there still seems to be a lack of management of obesity because once pregnant, options appear to be limited. It is not recommended that obese women lose weight during pregnancy due to the increased risk of ketosis and restricted nutrition adversely affecting the foetus.

The Cochrane review[23] revealed that energy/protein restriction has no clear effect on pregnancy-induced hypertension or pre-eclampsia, and its effect on other outcomes including maternal and perinatal morbidity and mortality has not been reported. This study demonstrates that women labelled overweight and obese at booking need to be considered as ‘high risk’ and have consultant lead shared care and be appropriately counselled regarding their risks when attending antenatal clinics.

Continuing education of health care workers on the deleterious effect of maternal obesity is needed. Further research and clinical trials are needed in the field of obstetrics to contribute towards evidence-based care of obese women. Many authors have reported on the pregnancy outcomes of obese women. However, audits must be performed to evaluate the quality of care provided to obese women. This is an important area of interest, on which there are no national guidelines. A care plan will improve the quality of care of obese women in obstetrics.

The effect of maternal underweight on obstetric performance is less clear. While some researchers[8] have found increased incidences of preterm delivery, Low birth weight and increased perinatal loss in these women, others[14] have reported a protective effect of maternal

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 03, 2024

underweight on certain pregnancy complications and interventions. In our study, low BMI in pregnant women was not seen to be associated with any major outcome. In fact, it may be a loon to third world countries where food deprivation is common.

Conclusion

Incidence of abnormal BMI is higher than normal BMI. Maternal BMI shows strong associations with pregnancy complications and outcomes. The risk increases with the degree of obesity and persists after accounting for other confounding demographic factors. Obesity is associated with increased incidence of caesarean delivery, Gestational diabetes, preeclampsia, postpartum infection, and induction of labour.

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