TO ASSESS THE EFFECT OF MATERNAL BMI ON OBSTETRICAL OUTCOME

Dr.Shuchi LAKHANPAL, M.B.B.S, Dr Asha AGGARWAL, M.D., Dr. Gurcharan KAUR , M.D.

Place of Study – Department of Obstetrics and Gynecology, Kasturba Hospital, Delhi, India

ABSTRACT:

AIMS: To assess the effect of maternal BMI on complications in pregnancy, mode of delivery, complications of labour and delivery.

METHODS:

A crossectional study was carried out in the Obst and Gynae department, Kasturba Hospital, Delhi. The study enrolled 100 pregnant women. They were divided into 2 groups based on their BMI, more than or equal to 30.0 kg/m2 were categorized as obese and less than 30 kg/m2 as non obese respectively. Maternal complications in both types of patients were studied.

RESULTS:

CONCLUSION: As the obstetrical outcome is significantly altered due to obesity, we can improve maternal outcome by overcoming obesity. As obesity is a modifiable risk factor, preconception counseling creating awareness regarding health risk associated with obesity should be encouraged and obstetrical complications reduced.

KEY WORDS: BMI, obesity, obstetrical outcome, preeclampsia, casaerean section

INTRODUCTION

WHO describes obesity as "One of the most blatantly visible, yet most neglected, public health problems that threaten to overwhelm both more and less developed countries". Obesity is a major public health issue and as per WHO, it is a "killer disease" at par with HIV and malnutrition. Even in countries like India, significant proportion of overweight and obese coexist

with the undernourished. Lifestyle modifications over the years have led to a more sedentary lifestyle. This is of global concern,[1] as excess bodyweight is now the sixth important risk factor contributing to disease worldwide and increased level of obesity may result in a decline in life expectancy in the future.[2]

The body mass index (BMI), or Quetelet index, is a heuristic proxy for human body fat based on an individual's weight and height. It was devised between 1830 and 1850 by the Belgian polymath Adolphe Quetelet during the course of developing "social physics".[3]

Obesity in pregnant women is associated with increased risk of Gestational diabetes, thromboembolism and is associated with hyperlipidemia and preeclampsia.

Obese women are more likely to undergo induction of labour, failed induction, operative vaginal delivery, shoulder dystocia and third and fourth degree perineal lacerations. Frequency of both 'Elective' and 'Emergency' caesarean section is increased in obese women. Anaesthetic complications like failed regional blocks and difficult intubation are more common in obese women. Also, there is an increased number of large for gestational age infants, lower apgar score and gross congenital malformations.

RESEARCH ELABORATIONS

MATERIALS N METHODS

Place of study - Deptt. Of Obstetrics and Gynaecology, Kasturba hospital, Delhi

Sample size - 100. 50 in each of the 2 groups (divided on the basis of BMI)

Study period - 1 April 2011- 20 April 2012

Type of study - Comparative Prospective study.

Statistical method used -

The data collected during the study is presented in the tabular form along with appropriate graphs and charts to draw meaningful observations and interpretations. Wherever deemed necessary, suitable statistical techniques are applied to establish the cause and effect relationships between selected variables. The differences in statistical parameters for different

outcomes of pregnant women with BMI>30 were tested statistically using appropriate tests viz. t-test, Fisher exact test, Chi square tests etc and the results are presented with p values < 5% considered statistically significant.

BMI formula

The BMI is equal to a person's weight divided by their height .It is calculated either as;

$$BMI = (weight\ in\ pounds/\ height\ in\ inches) \times 703$$

Or

$$BMI = (weight\ in\ kilograms\ /height\ in\ meters^2)$$

Based on this, patients to be studied will be divided into 2 groups of 50 patients each –

1. BMI less than 30

2. BMI more than 30

Inclusion criterion –

1. Primigravida with singleton pregnancy

2. Patients with gestational age more than 28 weeks

Exclusive criterion

1. Multifetal gestation

2. Multigravida

MATERIALS

The weighing machine used was from Equinox, an electronic personal scale CE.

Model : EB 1003

Strain gauge sensor

Capacity : 150kg(33016/24 stone)

Division : 0.1kg(0.216)

1.0"(25 mm) LCD digits

Low battery/ overload indication

Power : 1pc*3 V lithium cells (CR 2032)

Stadiometer used was from Bio Plus. A height measuring tape

Model no : 26M/1013522

Model approval mark : IND/09/2005/815

Size : 200cm / 78 inch

METHODOLOGY

Pregnant women coming for admission to labour room at the time of delivery were enrolled in the study after informed consent. A complete history work up and examination was done for the patient.

HISTORY

In all cases detailed history of the patient was taken including

.Name, age, education, religion, socio economic status

.Presenting complaints – Labour pains. Leaking per vaginum. hypertension, DM,

.History of present illness – if any

.Menstrual History – Last menstrual period, age of menarche, duration of Cycle, Length of cycle, Blood loss

.Obstetric History – Gravida, Parity, Number of live issues

.Past History, medical and surgical History – Any associated medical condition like diabetes mellitus, hypertension, tuberculosis, thyroid disease, asthma, any previous surgery.

.Family history- especially for obesity, diabetes and hypertension.

EXAMINATION

General examination- including general condition, hydration, PR, BP, temperature, pallor, icterus, cyanosis, edema, JVP, LN.

Weight(in kgs) was measured in kilograms. Patients were weighed without shoes, wearing light indoor clothes.

Height(in metres) was measured using a stadiometer. The patients were made to stand erect on the floor barefoot with both ankles together and parallel to each other. The head of the patient was held in such a position that the line joining the tragus and outer canthus of eye were in a horizontal plane (Frankfurts Plane), with the individual standing straight next to the wall with the heels, buttocks, shoulders and occiput touching the wall. The data were used to calculate Quetelet index or the BMI using the formula BMI= weight (kg)/height ^{2}(in m).

Systemic examination including cardiovascular, respiratory, central nervous system to rule out any systemic pathology

Per abdomen examination including contour, distension, venous prominence, stria, fundal height, presentation, fetal heart rate, regularity, estimated liquor, fetal weight, head floating/engaged. Also, local examination including vulva, vagina, urethra and Per speculum examination for cervix and vagina. Detailed Per vaginal examination was done for dilatation, effacement, position of cervix, station of presenting part, BISHOPS Scoring of the patient was then done. We also saw for adequacy of pelvis, leaking per vaginum/bleeding per vaginum.

INVESTIGATIONS

1. Blood group

2. CBC, ESR

3. FBS, PPBS

4. VDRL, HIV

5. Urine routine and microscopy

6. Obstetrical ultrasonography

7. Any other investigation needed as per patients requirement

After detailed history and examination, and after fulfilling the criterion for inclusion in the study, patients were divided into 2 groups-

1. BMI less than 30

2. BMI more than 30

In both the groups, fetomaternal outcome was studied along the following lines-

1. PREGNANCY ASSOCIATED CONDITIONS like hypertension, diabetes mellitus, abnormal presentations, IUGR, prematurity, postmaturity, any other illness

2. MODE OF DELIVERY – Normal vaginal delivery elective or emergency casaerean section, instrumental delivery.

3. LABOUR AND DELIVERY OUTCOME- Spontaneous or induced labour. First stage was studied to see progress of labour, and any complication like fetal distress, incoordinate uterine contractions, non progress of labour. Second stage to be studied for mode of delivery and any other complication, third stage for tear/PPH or any other complication.

4. CASAEREAN OUTCOME- difficulty in opening abdomen, uterine atony and any other complication.

ETHICAL ISSUES

As this was an observational study with no unethical interventions, or danger to the patient due to the study itself, it is an ethically sound study. Ethical clearance was taken by the hospital committee for the same.

RESULTS

A total of 100 cases, 50 with BMI>30 and 50 with BMI<30 were included in this study undertaken at Kasturba Hospital, Delhi. The primigravidas who presented in the labour room after 28 weeks of gestation were included. The antenatal, intrapartum, postpartum and neonatal assessment was done and outcome of each pregnancy in terms of maternal and perinatal morbidity and mortality were studied.

1.AGE DISTRIBUTION AND ITS RELATION WITH BMI

6% patients in the BMI >30 category were less than 20 years of age, 46% were in the 21-25 years age category, 34% in 26-30 and 14% in the 31-35 years of age. Also, in the BMI <30 category, 16% women were less than 20 yrs of age, 56% in 21-25 years, 24% in 26-30 years of age and only 4% in the 31-35 years. Mean age was 25.92 in the BMI>30 group compared with 24.2 in the BMI<30 group. We conclude that 48% of the BMI >30 category women were >26 years of age, whereas only 28% of the BMI < 30 group were in the >26 years category. If we consider patients above and below 25 years of age in different BMI categories, the p value comes out to be 0.039 making the difference statistically significant.

TABLE NO. 1 AGE DISTRIBUTION AND ITS RELATION WITH BMI

AGE	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE
<20	8	16	3	6	P=0.039
21-25	28	56	23	46	K^2=4.24
26-30	12	24	17	34	
31-35	2	4	7	14	

2.ANTEPARTUM COMPLICATIONS AND ITS RELATION WITH BMI

Out of a total of 50 pregnancies in each category, only 32% patients in the BMI>30 category were free of complications and the number increased to 78% when the BMI was less than 30.

Preeclampsia complicated 8% of the pregnancies with BMI <30 and 38% of the patients with BMI>30 obese. The difference was statistically significant with a p value of 0.0003.

Eclampsia was found in 2% patients in the BMI >30 category, and was not found in BMI <30 category. P value of 1 was statistically insignificant.

Retinopathy was 6% in the BMI >30 category and 2% in BMI <30. The difference was statistically insignificant with a p value of 0.617.

Also, GDM complicated 2% of the pregnancies with BMI < 30 and 6% in the BMI >30 category. The difference was statistically insignificant with a p value of 0.617.

IUGR was present in 4% of the pregnancies with BMI < 30 and 6% in the BMI >30 category. The difference was statistically insignificant with a p value of 0.646.

Preterm labour pains occurred in 6% of the pregnancies with BMI < 30 and 10% in the BMI >30 category. The difference was statistically insignificant with a p value of 0.54.

TABLE NO. 2 ANTEPARTUM COMPLICATIONS AND ITS RELATION WITH BMI

COMPLICATION	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE D.F=1
PRECLAMPSIA	4	8	19	38	P=0.0003 K^2=12.7
ECLAMPSIA	0	0	1	2	F.P=1 K^2=1.01
RETINOPATHY	1	2	3	6	F.P=0.617 K^2=1.04
GDM	1	2	3	6	F.P=0.617 K^2=1.04
IUGR	2	4	3	6	P=0.646 K^2=0.21,
PRETERM	3	6	5	10	K^2=0.54 F.P=0.7149
NO COMPLICATION	39	78	16	32	
TOTAL	50	100	50	100	

3. MALPRESENTATIONS AND ITS RELATION WITH BMI

Malpresentations were present in 2% patients with BMI <30 category and 4% in the BMI>30.

The difference was statistically insignificant with a p value of 1.

TABLE NO. 3 MALPRESENTATIONS AND ITS RELATION WITH BMI

MALPRESENTATION	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE D.F=1
NORMAL	49	98	48	96	F.P=1 K^2=0.34
ABNORMAL	1	2	2	4	

4. PERIOD OF GESTATION (POG) AT DELIVERY AND ITS RELATION WITH BMI

Preterm labour pains were present in 6% of the BMI < 30 group and 10% in BMI > 30 category. The difference was statistically insignificant with a p value of 0.7149.

Mothers reaching beyond term (post term) were 4% in the BMI < 30 group and no posterm patients were seen in the BMI > 30 group. The difference was statistically insignificant with a p value of 0.4949.

TABLE NO. 4 PERIOD OF GESTATION (POG) AT DELIVERY AND ITS RELATION WITH BMI

POG	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE D.F=1
PRETERM (<37 weeks)	3	6	5	10	F.P=0.7149 K^2=0.54
TERM	45	90	45	90	
POST-TERM	2	4	0	0	F.P=0.4949

(>40 weeks)					K^2=2.04

5. INTRAPARTUM COMPLICATIONS AND ITS RELATION WITH BMI

Fetal distress was present in 6% patients with BMI <30 category and was absent in the BMI>30 group. The difference was statistically insignificant with a p value of 0.24.

Also, NPOL was present in 2% patients with BMI <30 category and was absent in the BMI >30. The difference was statistically insignificant with a p value of 1.

Also, failure of induction occurred in 2% patients with BMI <30 and in 2% with BMI>30. No statistical analysis could be done due to similar values and it was found at equal frequency in both the groups.

Shoulder dystocia was present in only 2% of the patients in the BMI>30 category, whereas it was absent in patients with BMI<30. The difference was statistically insignificant with a p value of 1.

TABLE NO. 5 INTRAPARTUM COMPLICATIONS AND ITS RELATION WITH BMI

COMPLICATION	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE D.F=1
FETAL DISTRESS	3	6	0	0	K^2=3.09, F.P=0.24
NPOL	1	2	0	0	K^2=1.01, F.P=1
FAILED INDUCTION	1	2	1	2	No statistical analysis
SHOULDER DYSTOCIA	0	0	1	2	K^2=1.01, F.P=1

NONE	44	90	48	96	

6. MODE OF DELIVERY AND ITS RELATION WITH BMI

Mode of delivery was normal vaginal delivery in 76% of the BMI <30 category patients and 44% in BMI >30 category. One patient (2% patients) in the BMI<30 group required forceps for delivery of baby. Casaerean sections were required in 22% patients in BMI<30 category and in 56% patients in BMI>30 category. The difference was statistically significant with a p value of <0.001.

TABLE NO. 6 MODE OF DELIVERY AND ITS RELATION WITH BMI

MODE OF DELIVERY	BMI<30	BMI>30	K^2 AND P VALUE
NORMAL	38(76%)	22(44%)	$K^2 = 12.15$,
INSTRUMENTAL	1(2%)	0(0%)	D.F=1,
LSCS	11(22%)	28(56%)	p-value < 0.001

7. ANAESTHETIC COMPLICATIONS AND ITS RELATION WITH BMI

Anaesthetic complications including failed attempt at spinal anaesthesia and resort to general anaesthesia and intraoperative ECG changes of T wave inversion an ST segment depression were seen in the patients. These occurred in none of the patients in BMI <30 category and in 10.17% patients undergoing LSCS in BMI>30 category. Statistical analysis revealed that p value was 0.545 making the difference insignificant.

TABLE NO. 7 ANAESTHETIC COMPLICATIONS AND ITS RELATION WITH BMI

ANAESTHETIC	BMI<30(%)	BMI>30(%)	K^2 AND P

COMPLICATIONS			VALUE
FAILED SPINAL	0(0%)	2(6.78%)	K^2 = 1.28, D.F=1, F.P= 0.545
ECG CHANGES	0(0%)	1(3.39%)	
NONE	11(100%)	25(89.83%)	
TOTAL	11(100%)	28(100%)	

8. NEED FOR LSCS AND ITS RELATION WITH BMI

In the BMI<30 group, 27.27% patients had an elective LSCS whereas 72.72% had an emergency LSCS. In BMI>30 group, 35.714% patients had an elective LSCS whereas 64.285% had an emergency LSCS. The results were statistically insignificant with a p value of 0.719.

TABLE NO. 8 NEED FOR LSCS AND ITS RELATION WITH BMI

LSCS	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE
ELECTIVE	3	27.27	10	35.714	K^2=0.25 F.P=0.719
EMERGENCY	8	72.72	18	64.285	D.F.=1

TOTAL	11	100	28	100	

9. LSCS SURGICAL COMPLICATIONS AND ITS RELATION WITH BMI

Intraoperatively, we found that lower segment casaerean sections in BMI>30 group had higher incidence of bladder injury/ difficulty in opening/ trauma to neighbouring structures. In 2% patients with BMI <30 category and 10% in BMI>30 category, intraoperative LSCS complications were seen. Statistical analysis showed that K^2= 2.84 and p value = 0.204 making the difference statistically insignificant.

The complications included bladder injury in the BMI<30 patient (2%). Broad ligament rent was seen in 1 patient in BMI>30. We experienced difficulty in opening the abdomen for LSCS in 4 patients in the BMI>30 group, making a total 10% complication rate in the BMI>30 group.

TABLE NO. 9 LSCS SURGICAL COMPLICATIONS AND ITS RELATION WITH BMI

SURGICAL COMPLICATIONS OF LSCS	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE D.F=1
INTRAOP LSCS	1	2	5	10	K^2=2.84,
NO COMPLICATION	49	98	45	90	P=0.204
TOTAL	50	100	50	100	

10. MODE OF TERMINATION OF PREGNANCY AND ITS RELATION WITH BMI

Inductions were done in 12% of the BMI <30 category and 14% of the the BMI >30 category.

The difference was statistically insignificant with a p value of 0.766.

TABLE NO. 10 MODE OF TERMINATION OF PREGNANCY AND ITS RELATION WITH BMI

LABOUR	BMI < 30	BMI > 30	K^2 AND P VALUE
NO. OF PATIENTS INDUCED	6(12%)	7(14%)	K^2=0.09 P=0.766
SPONTANEOUS LABOUR	41(82%)	33(66%)	
ELECTIVE LSCS	3(6%)	10(20%)	

11. POSTPARTUM COMPLICATIONS (VAGINAL DELIVERY) AND ITS RELATION WITH BMI

PPH occurred in 2% of the patients with BMI <30 category and in 4% of the patients in the BMI>30 group. The difference was statistically insignificant with a p value of 0.604.

Cervical/ Paravaginal tears were present in 2% of the BMI <30 category and 4% in BMI>30 category. The difference was statistically insignificant with a p value of O.604.

TABLE NO. 11 POSTPARTUM COMPLICATIONS (VAGINAL DELIVERY) AND ITS RELATION WITH BMI

COMPLICATION	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE D.F=1
PPH	1	2	2	4	K^2=0.44 F.P=0.604
CERVICAL/VAGINAL TEAR	1	2	2	4	K^2=0.44 F.P=0.604
NONE	48	96	46	92	

12. POSTPARTUM COMPLICATIONS (CASAERAN DELIVERY) AND ITS RELATION WITH BMI

Wound infection was absent in the BMI <30 category and 6% in BMI >30 category. The difference was statistically insignificant with a p value of 0.24.

Hospital stay was prolonged in these 6% patients in BMI >30 category with Post LSCS wound infection. P value was calculated at 0.24 making it statistically insignificant.

TABLE NO. 12 POSTPARTUM COMPLICATIONS (CASAERAN DELIVERY) AND ITS
RELATION WITH BMI

COMPLICATION	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE D.F=1
POST LSCS WOUND INFECTION	0	0	3	6	F.P=0.24 K^2=3.09
NONE	50	100	47	94	

TABLE NO. 13 PREVALANCE OF ANEMIA AND ITS RELATION WITH BMI

Prevalence of anemia in BMI < 30 group was 22%, and in the BMI > 30 group was 16%. The
difference was statistically insignificant with a p value of 0.444.

TABLE NO. 13 PREVALANCE OF ANEMIA AND ITS RELATION WITH BMI

HB	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE D.F=1
<10	11	22	8	16	K^2=0.58, P=0.444
>10	39	78	42	84	

13.USG ABNORMALITIES AND ITS RELATION WITH BMI

Oligohydramnios in the BMI <30 category was 6%, and in the BMI >30 category was 4%.

Doppler abnormalities in the BMI >30 category was 8%, and these were conspicuously absent in the BMI <30 category. Low lying placenta was found equally in both the groups.

Both oligohydramnios and Doppler changes were seen in 4% patients in BMI<30 group and in 2% women in BMI>30 group.

The difference was statistically insignificant with a p value of 0.56.

TABLE NO. 13 USG ABNORMALITIES AND ITS RELATION WITH BMI

USG FINDINGS	BMI < 30 no.	BMI < 30 %	BMI > 30 no.	BMI > 30 %	K^2 AND P VALUE
NORMAL	44	88	42	84	K^2=0.33, P=0.56
OLIGOHYDRAMNIOS	3	6	2	4	
DOPPLER ABNORMALITY	0	0	4	8	
LOW LYING PLACENTA	1	2	1	2	
OLIGOHYDRAMNIOS AND DOPPLER	2	4	1	2	

DISCUSSION

The body mass index (BMI), or Quetelet index, is used to assess the degree of obesity in a patient, based on an individual's weight and height. It was devised between 1830 and 1850, and is defined as the individual's body weight (in kilograms) divided by the square of his or her height (in meters). The formulae universally used in medicine produces a unit of measure of

kg/m^2. Because BMI is derived from simple measurements of height and weight, it is clearly inexpensive.

In the recent times, obesity has emerged as a health hazard as excess bodyweight is a major cause of diseases worldwide and increased level of obesity may result in a decline in life expectancy in the future. Some investigators have suggested that certain ethnic groups like Asians may be at risk for comorbidities due to obesity at lower BMI thresholds than for other ethnic groups.

A total of 100 cases, 50 with BMI>30 and 50 with BMI<30 were included in this study undertaken at Kasturba Hospital, Delhi, from April 2011 to April 2012. The primigravidas who presented in the labour room after 28 weeks of gestation were included. The antenatal, intrapartum, postpartum and neonatal assessment was done and outcome of each pregnancy in terms of maternal and perinatal morbidity and mortality were studied.

AGE

In our study, 48% of the BMI > 30 category women were >26 years of age, whereas only 28% of the BMI < 30 group were in the >26 years category. The p value comes out to be 0.039 making the difference statistically significant. Mean age was 25.92 in the BMI>30 group compared with 24.2 in the BMI<30 group. This could be due to the age related weight gain in these patients.

Our results were comparable with Meher-Un-Nisa etal (2009) who reported that average age of obese patients was 25.2 and that of non obese was 24.1, showing that obesity was more often found in women of higher age.[29]

ANTEPARTUM COMPLICATIONS

Preeclampsia

In our study, the frequency of preeclampsia remained significantly high in BMI > 30 category as compared to BMI < 30 group. The frequency of preeclampsia was 38% in the BMI > 30 category and 8% in the BMI < 30 category. The difference was statistically significant with a p value of 0.0003. Eclampsia was found in 2% patients in the BMI >30 category, and was not found in BMI<30 category. P value of 1 was statistically insignificant.

Our results were comparable with Voigt et al (2008) who found that 37.9% patients in the BMI>30 category had preeclampsia and 1.2% in the BMI < 25 category had preeclampsia. [26]

Ehrenthal DB (2011) also concluded that preeclampsia was more common in the obese with a p value of less than 0.0001. [38]

Also, Baeten JM etal (2001) found that incidence of eclampsia increased with increasing BMI.[21]

Retinopathy

Retinopathy was 6% in the BMI >30 category, and 2% in BMI <30. The difference was statistically insignificant with a p value of 0.617.

This could be because of the higher prevalence of preeclampsia and GDM in the BMI>30 group as these are associated with retinal changes.

GDM

Results of our study show that rate of gestational diabetes mellitus in women with BMI>30 was 6% whereas it was only 2% in the BMI<30 category. The difference however was insignificant with a with a p value of 0.617.

Our results were similar to the study by Bianco AT etal (1998) reported in their study of 613 obese patients, a higher prevalence of gestational diabetes mellitus in the obese group (14.2%) as compared to their non obese group (1.2%). [92]

Kongubol A and Phupong V (2011) said that prepregnancy obesity without metabolic problems did not increase the risk for GDM. [41]

The risk of Diabetes Mellitus increases as the age increases, especially after 45 years of age. As our study group was of a younger age group, rates of diabetes were much lower.

IUGR

In our study, the frequency of IUGR remained insignificantly high in BMI > 30 category at 6%, compared to 4% in BMI < 30 group. The difference was statistically insignificant with a p value of 0.646.

This could be due to a possible confounding effect of preeclampsia, as obese patients have higher prevalance of preeclampsia, which has been associated with IUGR for long.

Our results corroborated with the findings of Perlow JH (1992) who reported intrauterine growth retardation at 8.1% in the obese compared to 0.9% in the non obese. However, when those massively obese pregnant women with diabetes and/or hypertension antedating pregnancy are excluded from analysis, no statistically significant differences in perinatal outcome persisted. [72]

Also, Baeten JM etal (2001) who found that IUGR in the overweight and obese group was 5.1% and 5.6% respectively, compared with 6.1% in the non obese group. [21]

Preterm labour pains

Preterm labour pains occurred in 6% of the pregnancies with BMI < 30 and 10% in the BMI >30 category. The difference was statistically insignificant with a p value of 0.7149.

Our study was similar to a study by Aly H etal (2010) who reported that mothers with obesity and morbid obesity were more likely to deliver prematurely (16.7 and 20.3%, respectively) when compared with non obese women (14.5%). However, when controlling for confounders, obesity and morbid obesity were not associated with prematurity. [81]

Similar results were reported by Mandal D etal (2011) who said that preterm labor in less than 34 week gestation was more common in the obese patients. [93]

MALPRESENTATIONS

Our study reported 4% patients with malpresentation in the BMI>30 group and 2% in the the BMI<30 group. The difference was statistically insignificant with a p value of 1. There was a single patient with breech presentation in the BMI<30 group and 2 patients with malpresentations in the BMI>30 group (1 breech and 1 transverse lie).

Our results were similar to those of Sheiner E etal (2004) reported malpresentations at a significantly higher rate in the obese gravida (P < 0.001). [94]

PERIOD OF GESTATION

Preterm labour pains occurred in 6% of the pregnancies with BMI < 30 and 10% in the BMI >30 category. The difference was statistically insignificant with a p value of 0.7149.

Mothers reaching beyond term (post term) were 4% in the BMI<30 group and no posterm patients were seen in the BMI>30 group. The difference was statistically insignificant with a p value of 0.4949.

Our results were inconsistent with those of Caughey AB etal (2009) who reported gestation beyond 41 weeks to include obesity as a cause(adjusted odds ratio [aOR], 1.26; 95% confidence interval [CI], 1.16-1.37). This could be due to the possible confounding effect of preeclampsia which led to earlier inductions/LSCS in the BMI>30 women. [95]

INTRAPARTUM COMPLICATIONS

Fetal distress

Fetal distress was present in 6% patients with BMI <30 category and was absent in the BMI>30 group. The difference was statistically insignificant with a p value of 0.24.

In contrast, Bianco AT etal (1998) found increased incidence of fetal distress(12.4%) in the obese as compared to non obese (8.7%). [92]

This difference could be due to earlier detection of compromised fetus in the BMI>30 category, due to higher degree of clinical suspicion in view of associated complications like preeclampsia, IUGR. Earlier inductions/ elective LSCS in the same could deter any fetal distress from arising in a stressed fetus also. Also, out of the 3 detected fetal disress patients in BMI<30 group, 2 were unbooked patients, not receiving any previous medical care.

NPOL

NPOL was present in 2% patients with BMI <30 category and was absent in the BMI >30. The difference was statistically insignificant with a p value of 1.

Our results were in contrast with those of Bianco AT etal (1998) reported a higher incidence of NPOL (12.9%) in obese as compared to 7.3% in the non obese. [92]

We actively manage labour patients in our hospital, and any abnormality in progress of labour is quickly detected. The difference in values could be due to the smaller sample size in our study.

Failure of induction

Failure of induction occurred in 2% patients with BMI <30 category and 2% in BMI>30. No statistical analysis could be done due to similar values and it was found at equal frequency in both the groups.

Shoulder dystocia

Shoulder dystocia was present in only 2% of the patients in the BMI>30 category, whereas it was absent in patients with BMI<30. The difference was statistically insignificant with a p value of 1.

Our results were similar to Meher-Un-Nisa etal (2009), who, in their study reported the frequency of shoulder dystocia to be high in overweight, obese and morbidly obese females (1−7%) as compared to normal weight group (0%). [29]

MODE OF DELIVERY

Results of our study show significantly higher rates of cesarean section in BMI>30 group as compared to those with BMI<30 group (56% versus 22%).

Our results could be compared with those of Pevzner L etal (2009) said that the incidence of cesarean delivery increased from 21.3% in the BMI less than 30 group to 29.8% in the BMI 30-39.9 group and 36.5% in the BMI 40 or higher group. [51]

Also, Kominiarek MA etal (2010) said that the risk for cesarean increased as BMI increased for all subgroups, $P< .001$. The risk for cesarean increased by 5%, 2%, and 5% for nulliparas and multiparas with and without a prior cesarean, respectively, for each 1-kg/m^{2}increase in BMI. [54]

ANAESTHETIC COMPLICATIONS

Anaesthetic complications occurred in none of the patients in BMI <30 category and in 10.17% of patients with BMI>30. These complications included failure of spinal anaesthesia in 2 patients and need for general anaesthesia in them. Also, 1 patient in BMI>30 category had intraoperative changes in the ECG suggestive of myocardial infarction and was treated for the same. Statistical analysis revealed that p value was 0.545 making the difference insignificant.

Our results matched with Mace HS etal (2011) who found obese pregnant women appear to have increased morbidity and mortality associated with caesarean delivery and general anaesthesia for caesarean delivery in particular, and more anaesthesia-related complications.[57]

ELECTIVE AND EMERGENCY LSCS

In the BMI<30 group, 27.27% patients had an elective LSCS whereas 72.72% had an emergency LSCS. In BMI>30 group, 35.714% patients had an elective LSCS whereas 64.285% had an emergency LSCS. The results were statistically insignificant with a p value of 0.719.

Our results were inconsistent with that of Bhattacharya etal (2007), who reported 41.5% emergency LSCS in the normal and 58.8% in the obese group. [96]

Our results were comparable with Elíasdóttir ÓJ etal (2010) who said that obese women have a significantly increased risk of induction of labour and being delivered by cesarean section, both emergent and elective compared to mothers of normal weight and overweight. [36]

This was because many of the high risk patients with preeclampsia/ IUGR were taken up for elective LSCS directly in our hospital.

Most common reason for casaerean sections in BMI>30 group was preeclampsia with/without IUGR/Doppler abnormalities. Most common reason for casaerean sections in BMI<30 group was Meconium stained liquor intrapartum.

INTRAOPERATIVE LSCS COMPLICATIONS

Intraoperative lower segment caesarean sections were complicated in 2% patients with BMI <30 category and 10% in BMI>30 category. Statistical analysis showed p value of 0.204 making it statistically insignificant. These included difficulty in opening up the patient for LSCS in 4 patients with BMI> 30 and rent in broad ligament in 1 of them. In 1 unbooked patient with BMI<30, we did an emergency LSCS in view of obstructed labour and she had bladder injury intraoperatively.

Our results were similar to those of Perlow JH etal (1994) who reported that massively obese pregnant women undergoing cesarean section were at significantly increased risk for peroperative morbidity. [72]

Norman JE and Reynolds RM (2011) also found that obesity complicates operative delivery; it makes operative delivery more difficult, increases complications and paradoxically increases the need for operative delivery. [69]

NEED FOR INDUCTION

Inductions were done in 12% of the BMI <30 category and 14% of the the BMI >30 category. The difference was statistically insignificant with a p value of 0.766.

The most common indication for induction in the BMI>30 group was preeclampsia whereas in BMI<30 group was postdatism.

Our results were comparable with Jensen DM etal (2003) reported that the risk of induction of labor was significantly increased in both overweight women (body mass index [BMI] 25.0-29.9 kg/m2) and obese women (BMI ≥ 30.0 kg/m2) compared with women who were of normal weight (BMI 18.5-24.9 kg/m2). [22]

Also, Elíasdóttir ÓJ etal (2010) who reported that obese women have a significantly increased risk of requiring induction of labour compared with normal weight women. [36]

POSTPARTUM COMPLICATIONS

PPH

PPH occurred in 2% of the patients with BMI <30 category and in 4% of the patients in the BMI >30 category. The difference was statistically insignificant with a p value of 0.604.

Our results were consistent with those of T.S. Usha Kiran, S. Hemmadi , J. Bethel, J. Evans (2005) who reported an increased risk [quoted as odds ratio (OR) and confidence intervals CI)] of maternal complications such as blood loss of more than 500 ml, amounting to postpartum haemorrhge. [48]

Cervical/ Paravaginal tears

Cervical/ Paravaginal tears were present in 2% of the BMI <30 category and 4% in BMI>30 category. The difference was statistically insignificant with a p value of 0.604.

Our results were comparable with Liu X etal (2011) who found a significant increase in postpartum hemorrhage and perineal rupture in obese patients. [66]

WOUND INFECTION

Wound infection was absent in the BMI <30 category and 6% in BMI >30 category. The difference was statistically insignificant with a p value of 0.24.

The local changes, such as an increase in adipose tissue, an increase in local tissue trauma related to retraction, the immune dysfunction, increased association of diabetes with obesity and a

lengthened operative time, may contribute to the increased incidence of surgical site infections caused by obesity.

Our results can be compared with those of Satpathy HK etal (2008) who reported that following Cesarean section delivery, obese women have a higher incidence of wound infection and disruption. [63]

Alanis MC etal (2010) reported that women with a body mass index $>$ or $= 50$ kg/m^2 have a much greater risk for cesarean wound complications than previously reported. Avoidance of subcutaneous drains and increased use of transverse abdominal wall incisions should be considered in massively obese parturients to reduce operative morbidity. [53]

Mandal D etal (2011) said that obese pregnant women were at increased risk of postpartum infection morbidities. [93]

ANEMIA

Prevalence of anemia in BMI>30 was 16% and 22% in the BMI<30 category. The difference was statistically insignificant with a p value of 0.444.

These results could be due to possible nutritional etiology of anemia in the population with BMI<30.

Our results could be compared with Galtier-Dereure F etal (2000) who reported that anemia appears to occur less often in severely obese pregnant women than in normal-weight pregnant women. [73]

Aly H etal (2010) found that mothers with obesity and morbid obesity were more likely to have anemia than normal weight women. [81]

USG

Oligohydramnios in the BMI <30 category was 6%, and in the BMI >30 category was 4%.

Doppler abnormalities in the BMI >30 category was 8%, and these were conspicuously absent in the BMI <30 category.

The difference in ultrasound findings remained statistically insignificant with a p value of 0.56.

CONCLUSION

From our study we may conclude that there is a higher prevalence of complications to both the fetus and the mother when BMI is more than 30 in the mother. Women with BMI>30 had significantly higher age than women with BMI less than 30, and were associated with significantly increased incidence of preeclampsia, casaerean sections, and lower APGAR. There was an insignificant increase in eclampsia, retinopathy, gestational diabetes mellitus, intra uterine growth restriction, preterm labour pains, malpresentations, shoulder dystocia. Also, anaesthetic complications, elective casaerean sections and intraoperative complications, inductions, postpartum hemorrhage, cervical/paravaginal tears, post-operative wound infection, Doppler abnormalities and macrosomia were insignificantly higher in the BMI more than 30 group. The incidence of failed induction and intra uterine deaths was similar in both the groups

The following were insignificantly higher in the BMI less than 30 group: postdatism, fetal distress, non progress of labour, anemia, oligohydramnios, low birth weight, meconium aspiration syndrome, NICU admissions.

Therefore, it is a must for all pregnant and non pregnant women to be aware of the fetomaternal complications arising due to higher Body Mass Index. With proper management of pregnant women with a higher BMI, improvement in awareness amongst the women and increasing their accessibility to medical facilities, maternal and perinatal morbidity and mortality can be minimized. Preconceptional weight loss and limited pregnancy weight gain can be helpful in achieving the goal we all strive for, a healthy mother and a healthy baby.

ACKNOWLEDGEMENT

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