Section: Miscellaneous

Original Research Article

EFFECT OF INCREASING BODY MASS INDEX ON PREGNANCY OUTCOMES IN NULLIPAROUS WOMEN DELIVERING SINGLETON BABIES

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Abstract

Background: Obesity is a global health problem that is increasing in prevalence. Obesity during pregnancy is considered a high-risk state because it is associated with many complications. This study was conducted to assess the direct relationship of maternal obesity, judged by BMI and its effect on fetomaternal outcome. **Materials and Methods:** The prospective cohort study was conducted at Department of Obstetrics and Gynaecology, GMSH, Chandigarh. It includes 300 patients (100 in each of the 3 groups, divided on the basis of BMI). The study includes nulliparous pregnant women attending OPD for antenatal care within first trimester of pregnancy. In all the groups, labor and delivery outcomes were studied along with the mode of delivery and fetal outcome. **Result:** A total of 330 pregnant women were enrolled in our study. In our study group, 6% of the patients of normal BMI had PIH, 34% of Overweight and 41% of Obese had PIH (P<0.001). Significant results were obtained on comparing failed induction, failure of progress of labour, and shoulder dystocia with increasing BMI (p<0.05). In our study, obese patients had statistically significant incidence of PPH with increasing BMI (P=0.002). In our study, results were statistically significant on comparing APGAR scores with increasing BMI (p=0.045). **Conclusion:** The present study has shown an association between adverse pregnancy outcomes and the increasing BMI of the mother. There was an insignificant increase in intraoperative complications, wound infection, abnormal fetal heart rate patterns with increasing maternal BMI.

INTRODUCTION

Obesity is a global health problem that is increasing in prevalence. The World Health Organization characterizes obesity as a pandemic issue, with a higher prevalence in females than males. The National Family Health Surveys (NFHS) in India indicated an increase in the obesity from 10.6% in 1998–1999 to 14.8% in 2005–20061. Obesity during pregnancy is considered a high-risk state because it is associated with many complications. Even moderate overweight is a significant risk factor for obstetrical complications and needs a multidisciplinary antenatal management in order to prevent materno-fetal complications.[1]

The body mass index (BMI), or Quetelet index, was devised between 1830 and 1850 by the Belgian polymath Adolphe Quetelet during the course of developing "social physics".[2] Body mass index is defined as the individual's body weight divided by the square of his or her height. The formulae universally used in medicine produce a unit of measure of kg/m^2.

Overweight and obese women are at increased risk of several pregnancy complications, including gestational diabetes mellitus, hypertension, preeclampsia, cesarean delivery, and postpartum weight retention. Similarly, fetuses of pregnant women who are overweight or obese are at increased risk of prematurity, stillbirth, congenital anomalies, macrosomia with possible birth injury, and childhood obesity. 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. Caesarean in Obese gravidas is associated with a prolonged 'incision to delivery interval', higher bloodloss, longer operative times, wound infection and endometritis. Anaesthetic complications like failed regional blocks and

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difficult intubation are more common in obese women. By screening women for obesity and obesity-related complications, the obstetrician/gynecologist can help improve health outcomes for women and their infants. Also, children who are LGA at birth and exposed to an intrauterine environment of either diabetes or maternal obesity are at increased risk of developing Metabolic syndrome, thus perpetuating the cycle of obesity and insulin resistance in subsequent generations.[3]

Obesity has been related with many pregnancy related complications. Many complications have been singularly linked with obesity. Most of the available studies are from the developed world and there is a paucity of similar studies in India. Hence, there is a need to study the burden and association of obesity and fetomaternal outcome in Indian women. This study is directed to assess the direct relationship of maternal obesity, judged by BMI and its effect on fetomaternal outcome.

Aims and objectives

1. To assess the effect of maternal BMI on complications in pregnancy in terms of PIH, GDM.
2. To assess the effect of maternal BMI on mode of delivery in terms of normal vaginal delivery, LSCS.
3. To assess the effect of maternal BMI on complications of labour and delivery in terms of intrapartum, intraoperative and post-partum complications.
4. To assess the effect of maternal BMI on fetal outcome in terms of gestation, birth weight, APGAR score and NICU admission.

MATERIALS AND METHODS

The prospective cohort study was conducted at Department of Obstetrics and Gynaecology, GMSH, Chandigarh. It includes 300 patients (100 in each of the 3 groups, divided on the basis of BMI). Sample size is calculated on the basis of macrosomia (because it gave the maximum sample size) with reference to the study by Jain et al.[4] It was found that in overweight and obese ladies incidence of macrosomia was 14.71% whereas in underweight and normal women it was 0%. Our sample size came out to be total 300 (divided in 3 groups of 100 each) at a power of 80% and confidence interval of 95%. Sample size is calculated using package EPI Info-6.

The study includes nulliparous pregnant women attending OPD for antenatal care within first trimester of pregnancy.

Inclusion Criteria

1. Primigravida with singleton pregnancy

Exclusive Citéria

1. Multifetal gestation
2. Multigravida
3. Congenital malformation
4. Pregnancy with known medical disorders

Methodology

Nulliparous Pregnant women attending OPD for antenatal care within first trimester of pregnancy and willing to come for regular checkup throughout pregnancy were enrolled in the study after informed consent. This was my study population. After fulfilling inclusion and exclusion criteria women were divided into three groups according to BMI. In each group there were 100 participants. Women were followed up during routine antenatal visits. A complete history work up and examination was done for the patient.

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 are 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 was 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. Patient was regularly followed throughout pregnancy on her routine antenatal visits till her delivery. On each antenatal visit weight gain, fundal height, blood pressure, pallor, edema, urine-albumin, sugar was checked. Her blood pressure was monitored and 2 hr oral glucose tolerance test with 75 gms glucose was advised at 24-28 weeks. Also, her first trimester scan, ultrasound level II scan, ultrasound fetal wellbeing and BPP before delivery were done.

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 done. We also saw for adequacy of pelvis, leaking per vaginum/bleeding per vaginum. Investigations were done as required by the patient. Labour was monitored closely, Mother's vitals were recorded every 4 hrly, Fetal heart rate was auscultated every 15 min in first stage and every 5 min in second stage. Mode of delivery was decided according to fetomaternal condition and progress of labour. Pediatrician was called to evaluate and manage the neonate in complicated deliveries. Mother and baby were followed till discharge.

In all the groups, pregnancy outcomes were studied along the following lines:

1. Pregnancy Associated Condition: like pregnancy induced hypertension, gestational diabetes mellitus.

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2. Mode of Delivery: Normal vaginal delivery elective or emergency cesarean section, instrumental delivery.
3. Labour and Delivery Outcome: Spontaneous or induced labour. First stage will be studied to see progress of labour, and any complication like abnormal fetal heart rate pattern, Sinusoidal pattern, active phase abnormalities such as arrest of dilatation, arrest of descent, failed induction, shoulder dystocia. Second stage to be studied for mode of delivery and any other complication, third stage for tear/Postpartum haemorrhage (loss of 500 ml of blood or more in vaginal delivery after completion of third stage of labour,1000ml or more in cesarean delivery) or any other complications such as cervical/vaginal tears, perineal tears, wound infection.
4. Casaerean Outcome (Intraoperative complications): difficulty in opening abdomen, uterine atony and any post-operative morbidity.
5. Fetal Outcome: APGAR at 1 and 5 minutes.

Statistical Method Used

The statistical analysis will be carried out using Statistical Package for Social Sciences (SPSS sInc., Chicago, IL, version 18.0 for Windows). Mean & medians will be calculated for all quantitative variables and for measures of dispersion standard deviation or standard error will be calculated. Normality of data will be checked by measures of Kolmogorov Smirnov tests of normality. For normally distributed data means of 3 groups will be compared using ONE WAYANOVA followed by posthoc multiple comparisons. For skewed data Kruskal Wallis H test for three groups, followed by Mann –Whitney test for 2 groups will be applied. Qualitative or categorical variables will be described as frequencies and proportions. Proportions will be compared by using Chi square or Fisher's exact test whichever is applicable. All statistical analysis tests will be two tailed and P value < 0.05 will be taken as significant.

RESULTS

A total of 330 pregnant women were enrolled in our study in 2013-2014, the study sample consisted of 300 pregnant women as 3 had abortion,1 had twins, 26 were lost to follow up (9%).

Age Distribution

In our study, 18% of the normal BMI,16% of the overweight, 6% of obese were under or equal to 20 years of age; 51% of the nomal, 56% of overweight,44% of obese were of the age group 21-25 years of age; 23% of normal,22% of overweight,39% of obese were in the age group 26-30years; 8% of the normal, 6% of overweight,11% of obese were >30years of age. Mean age of normal BMI women was 24.11years, among overweight was 24.16 years, obese was 26.05 years. Women in normal BMI group and overweight group were younger than those of obese group. Overall the mean age of our study population was 4.77years [Figure 1].

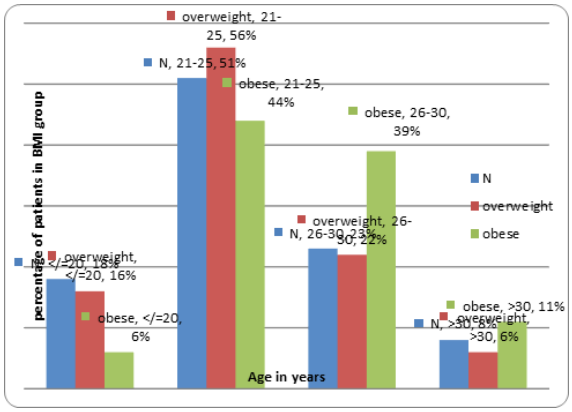

Figure 1: Age distribution

Pregnancy Induced Hypertension

In our study group, 6% of the patients of normal BMI had PIH, 34% of Overweight and 41% of Obese had PIH. Thus, the incidence of PIH increased with increasing BMI, with a p value of <0.001which is significant. In our study, none of the women among normal BMI had GDM, while 2% among overweight, and 5% of the obese had GDM. P value was 0.062 which was statistically insignificant [Table 1]. In our study population, the rate of preterm, term and post term deliveries were insignificantly associated with the BMI [Table 1].

Intrapartum Complications

In our study, 5% of the patients with normal BMI, 6% among overweight, 12% of obese had LSCS done in view of abnormal FHR pattern (p=0.154). However, significant results was obtained on comparing failed induction, failure of progress of labour, and shoulder dystocia with increasing BMI (p<0.05).

Mode of Delivery (MOD): In our study, 76% & 74% of women with normal BMI & Overweight had normal deliveries. However, 50% of Obese patients had LSCS (p<0.001) [Table 3].

Postpartum Complications: In our study, obese patients had statistically significant incidence of PPH with increasing BMI (P=0.002) [Table 4].

Induction: In our study, 10% among the normal BMI category had to be induced, while 12% among the overweight, 28% among the obese had to be induced (p<0.001).

Apgar Score: In our study, results were statistically significant on comparing APGAR scores with increasing BMI (p=0.045).

Table 1: Frequency of PIH, GDM and Gestation

Variables	Normal BMI	Overweight	Obese	P Value
PIH	6%	34%	41%	< 0.001
GDM	0%	2%	5%	0.062
Preterm	5%	4%	8%	0.465

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Term	91%	91%	88%	0.967
Posterm	4%	5%	4%	0.926

Table 2: Intra-operative Complications.

Intrapartum Complications	Normal	Overweight	Obese	P Value
Abnormal FHR pattern	5%	6%	12%	0.154
Failure of Progress of Labour	3%	3%	11%	0.023
Failed Induction	3%	4%	12%	0.021
Shoulder Dystocia	1.28%	2.63%	10%	0.034

Table 3: Mode of Delivery

MOD	Normal	Overweight	Obese
NVD	76%	74%	46%
Forceps/Ventouse	2%	2%	4%
LSCS	22%	24%	50%

Table 4: Postpartum Complications

Postpartum Complications	Normal	Overweight	Obese	P Value
PPH	3%	4%	15%	.002
Cervical/Vaginal/Perineal Tear	1.28%	3.9%	8%	.33
Wound Infection In LSCS Patients	4.5%	8.33%	12%	.595

Table 5: Induction

Variable	Normal	Overweight	Obese	P Value
Inducton Done	10%	12%	28%	<0.001

Table 6: APGAR score

APGAR Score	Normal	Overweight	Obese	P Value
<7	8%	6%	16%	0.045
>7	92%	94%	84%	

DISCUSSION

Age Distribution

Our results were comparable with Meher-Un-Nisa et al (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 groups.[5]

Pregnancy Induced Hypertension

Our results were comparable to Deepika Jain et al (2011) who reported that PIH increased linearly with increasing BMI with p value <0.001 which is statistically significant.4 Mandal D et al (2011) found that in comparison to average weight women, obese women were at increased risk of PIH with p value <0.001.[6] Anjana Verma et al (2012) found that women who were overweight, obese had significantly increased risk of geastational hypertension with p value 0.01.[7]

Gestational Diabetes Mellitus

Bianco AT et al (1998) reported that Gestational weight gain was not associated with adverse perinatal outcome.8 Kongubol A and Phupong V (2011) said that prepregnancy obesity without metabolic problems did not increase the risk for GDM.[9] The risk of Diabetes Mellitus increases as the age increases, especially after 35 years of age. As our study group was of a younger age group, rates of diabetes were much lower.[10]

Gestation

Our study was similar to a study by Aly H et al (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.[11] Sohinee Bhattacharya et al found no difference in the risk of preterm delivery in the different BMI categories.[12] Our finding was supported by Shalza Yazdani et al who found no difference in postdated deliveries with increasing BMI (p value= 0.09).[13]

Intrapartum Complications: Bianco AT et al (1998) found increased incidence of fetal distress (12.4%) in the obese as compared to non-obese (8.7%).[8] Mesomeh Rezaie et al (2013) found that the OR for fetal distress rate increased from 1.0 in women with a normal BMI to 3.18 in women with a BMI≥35.[14]

Failure of Progress of Labour: Our results were comparable with those of Bianco AT et al (1998) reported a higher incidence of NPOL (12.9%) in obese as compared to 7.3% in the non-obese.[8] Vahratian A et al (2004) said that Labor progression in overweight and obese women was significantly slower than that of normal-weight women before 6 cm of cervical dilation.[15]

Failure of Induction

Our study was comparable to Kabiru W et al (2004) reported that Increase in BMI category was associated with higher rates of failed induction (p < .001).[16]

Shoulder Dystocia

Our results were similar to Meher-Un-Nisa et al (2009), who in their study reported the frequency of

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shoulder dystocia to be high in overweight, obese and morbidly obese females (1–7%) as compared to normal weight group (0%).[5]

Mode of Delivery

Our results were comparable to Deepika Jain etal (2012) who observed that maximum women who underwent LSCS were overweight (54.32%) and obese (61.90%).[4] M Rezaie etal (2013) showed that there is significant association between cesarean section and higher maternal BMI.[14]

Intraoperative Complications

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.[17]

Postpartum Complications

Our results were consistent with those of Deepika Jain etal (2012) who found that Obese women were more likely to have post partum hemorrhage [OR 5.11 (95 % CI 1.76–14.79)] compared with women of normal BMI ,p value <.001.4 Regarding cervical, vaginal and perineal tears our results were comparable with Beyer DA et al (2011) who found no significant difference in the rate of tears and laceration among different BMI groups.[18] Anjana verma et al(2012) reported higher incidence of wound sepsis in obese (p value =0.001).[7]

Need for Induction

Our results were comparable with Jensen DM et al (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).[19]

APGAR Score

Our results were comparable with Baron CM et al (2010) who reported that the neonates of obese parturients were more likely to have 1-minute Apgar scores of < or =7.0 and require admission to a special care unit.[20]

CONCLUSION

Our study has shown an association between maternal overweight and obesity and adverse pregnancy outcomes. Women who were overweight and obese were older than their normal weight counterparts and were associated with significantly increased incidence of PIH, induction of labour, failure of progress of labour and failed induction, shoulder dystocia, casaerean sections, PPH. The babies of obese mothers had increased incidence of lower APGAR scores, NICU admissions, fetal macrosomia. There was an insignificant increase in intraoperative complications, wound infection, abnormal fetal heart rate patterns.

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