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THE ADVERSE IMPACT OF MATERNAL OBESITY ON MATERNAL AND PERINATAL OUTCOME

Gynaecology

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ABSTRACT

Introduction: Rapidly increased global prevalence of overweight and obesity has also affected women of reproductive age group. Pregnant women who are obese at booking have an increased risk for complications, both for themselves and their babies during pregnancy and childbirth. Women who are obese are at risk for gestational diabetes, miscarriage, preeclampsia, increased incidence of cesarean section, anesthetic complication, postpartum hemorrhage, thromboembolism, perineal trauma, and wound infection. There is an increased risk of stillbirth, congenital anomalies, prematurity, macrosomia, poor APGAR scores, and neonatal death in babies of obese mothers. This study investigated the effect of Maternal BMI on the mode of delivery and perinatal outcome.

Methods: This is a prospective cohort study of 100 primigravidas of the reproductive age group done at Shivpuri District Hospital over a period of a year. We categorized them on the basis of their BMI at booking and studied the mode of delivery and perinatal outcome.

Results: Elective cesarean and emergency cesarean were more common with obese women whereas most of the normal weighted and underweight women underwent spontaneous labor and induced labor. Maternal and fetal complications were more pronounced in the overweight and obese groups. Babies also had an increased risk of poor APGAR scores with the increasing BMI of the mother.

Conclusion: Input of skilled birth attendants is essential to improve intrapartum outcomes. Obstetricians need to be acutely aware that obese patients form a high-risk population with an increased incidence of cesarean section, postpartum hemorrhage, and perineal trauma.

KEYWORDS

Obesity, Cesarean section, APGAR scores.

INTRODUCTION:

Obesity has become a modern-day epidemic with implications across the whole of the healthcare services, not just the maternity services. The predominant etiology of obesity is an imbalance between the number of calories consumed and the amount expended. The sharp rise in the prevalence of obesity is multifactorial and amongst others, the result of changes in dietary habits, sedentary lifestyles, and urbanization[1].

Obesity is viewed as an important public health problem that causes several diseases like chronic hypertension, diabetes, cardiovascular diseases, stroke, cancer, etc. This will cause decreased life expectancy in the future[2].

According to the World Health Organization, women can be classified into four groups according to body mass index (BMI)[3].
Underweight (<18.5 kg/m^2),
Normal (18.5–24.9 kg/m^2),
Overweight (25.0–29.9 kg/m^2) and
Obese (≥30.0 kg/ m^2)8

There are reports that more and more women are overweight at the start of their pregnancy (BMI at booking ≥25 kg/m^2) with rates ranging between 15% to 30%.

Pregnant women who are obese at booking have an increased risk for complications, both for themselves and their babies during pregnancy and childbirth. Women who are obese are at risk for gestational diabetes, miscarriage, pre-eclampsia, thromboembolism and postpartum hemorrhage.[4,5] There is a growing body of evidence that maternal obesity might represent an independent risk factor for instrumental delivery and cesarean-section delivery, and adverse neonatal outcomes such as macrosomia, shoulder dystocia, and stillbirth.[6,7]

Additionally, maternal health can have a significant impact on the in utero environment and, thus, on fetal development and the health of the child later in life.

WHO declares obesity as a pandemic issue, having a high prevalence in females, especially in the childbearing age than in males[5] Increasing BMI is associated with increased adverse obstetric and fetal outcomes.

Maternal obesity impacts the growing fetus/embryo by way of several pathways: genetic, environmental, and the diverse network of interactions between them. The exact mechanism by which obesity mediates poor health outcomes for both mother and fetus is far from clear.[8]

Glucose was considered the main metabolite that transmits the effect of obesity to the developing fetus. Maternal hyperglycemia and hypertriglyceridemia increase pregnancy complications in the obese population The altered endocrine milieu associated with obesity (increased levels of insulin, androgens, and leptin) is also associated with a number of maternal metabolic disturbances such as insulin resistance, diabetes, and increased blood pressure all of which influence fetal well-being.[9,10]

Studies have shown that obesity is related to a 2.95 times higher risk of developing gestational diabetes mellitus, there is increase prevalence of, preeclampsia (9.1%),[11] long term risk of type 2 diabetes mellitus (41% of women developed type 2 diabetes mellitus during 10 years of following up[12]) and increased incidence of venous thromboembolism[13].

There is a higher incidence of Intrapartum complications in obese pregnant patients. Women with a BMI >30 receive more oxytocin for induction[14], there is a slow progression of labor from four to ten cm, increased risk of dysfunction labor (due to dyslipidemia and other metabolic factors which adversely affects the myometrial contractility)[8] and increased incidence of emergency cesarean section. As there is an increased incidence of the cesarean section there is also an increased requirement of anesthesia and a higher risk of anesthesia-related morbidity. There is higher chances of epidural failure, increased risk of aspiration during GA, difficult endotracheal intubation, difficulty in achieving regional anesthesia, and increased risk of postoperative hypoxemia and atelectasis [15,16,17]

Various studies have shown that obese women are at increase risk of fetal anomalies like spina bifida, omphalocele, heart defects, anorectal atresia, hypospadias, limb reduction defects, and diaphragmatic hernia. [18,19,20] These defects may be linked to insulin resistance, diabetes, or specific nutritional deficiency.[20]

Increased incidence of fetal and neonatal complications are there in obese women. There is an increased incidence of first-trimester

miscarriage and recurrent miscarriage.[21] In a study double rate of stillbirth was found in obese women than healthy women.[15] Maternal obesity remain associated with an increased rate of fetal macrosomia which is a risk factor for operative delivery, a low APGAR score at one minute as well as shoulder dystocia and increased incidence of birth injuries to the baby, including fractures and nerve palsies.[22]

After delivery, obese women remain at higher risk of postpartum hemorrhage. Several studies have shown that there is an increased incidence of urinary tract infection (UTI), genital tract infection, and wound infection. [23,24.] There is an increased risk of venous thromboembolism in these patients due to obesity, preeclampsia, increased frequency of operative delivery and a higher level of coagulation factors VIII and IX [25] Obesity is related to decrease breastfeedings rates (less likely to initiate and maintained breastfeeding)[26]

Increased incidence of Poor APGAR score for neonates born to obese mothers (apart from Macrosomia) can be explained by various biochemical and metabolic derangements that neonates born to obese mothers may be more at risk. These range from hypoglycemia, hyperglycemia, and hypothermia to hyperbilirubinemia.

Children of obese mothers remain at increase risk of long-term morbidity there is an increased incidence of obesity type 2 diabetes mellitus and cardiovascular diseases in of spring of obese mothers Epigenetic processes have a crucial role in determining fetal, neonatal, and adult health.[27]

Our study aimed to investigate the effect of Maternal BMI at booking with the mode of delivery and the perinatal outcome.

METHODS:

This study was conducted at government medical college SHIVPURI in collaboration with the department of pediatrics from 1st July 2019 to 30 June 2020.

100 primigravida were studied who fulfilled the inclusion and exclusion criteria

Cohort Analysis

- A prospective cohort study of 100 women (Primigravida)with a booking BMI.
- Inclusion criteria in the study group were as follows:
- Booking BMI should be available
- Singleton pregnancies
- Cephalic presentation

Exclusion Criteria In The Study Group Were As Follows:

- Planned cesarian for malpresentation
- Prior uterine surgery
- IUD
- Prenatal & Postnatal diagnosed congenital anomaly
- No documented pre-pregnancy weight
- One who received epidural analgesia
- GHTN & GDM

All the primigravida were booked at their first antenatal visit and their BMI was calculated.

And they were followed till the term (40 weeks), they were watched for spontaneous labor, if not then induced and further studied for the final mode of delivery.

Also, the neonatal outcome was taken into consideration based on the APGAR score in collaboration with the pediatric department.

RESULTS

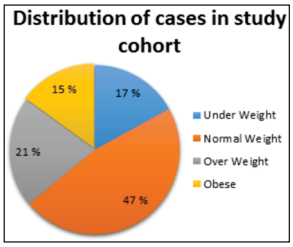

Figure 1:- Distribution Of Cases In Study Cohort.

Among 100 Primigravida patients 17 were under weight, 47 were normal weight, 21 were over weight and 15 were obese.

Table 1:- Correlation Of Mode Of Delivery With Obesity And BMI

BMI	Spontaneous Labor	Induced Labor	Assisted Labor	Elective Caesarean	Emergency Caesarean	Total
Under weight (<18.5)	10 (58.82%)	5 (29.41%)	0 (0%)	0 (0%)	2 (11.76%)	17 (100%)
Normal weight (18.5-24.9)	29 (52.73%)	17 (30.91%)	6 (10.91%)	1 (1.81%)	2 (3.64%)	55 (100%)
Over weight (25.0-29.9)	7 (36.84%)	6 (31.58%)	2 (10.53%)	1 (5.26%)	3 (15.79%)	19 (100%)
Obese (≥30)	2 (14.29%)	4 (28.57%)	2 (14.29%)	3 (21.43%	3 (21.43%)	14 (100%)
Total	48 (45.71%)	32 (30.48%)	10 (9.52%)	7 (6.67%)	8 (7.62%)	105 (100%)

$\chi 2=22.33$ P=0.033 NS

Our result shows that the overweight and the obese group had more chances of having assisted, elective and emergency cesarean. Out of 17 underweight women, only 2 had an emergency cesarean. Out of 55 women who were having normal weight, again only 2 women had to undergo cesarean delivery. Out of 19 overweight and 14 obese women, 3 each has to undergo cesarean delivery.

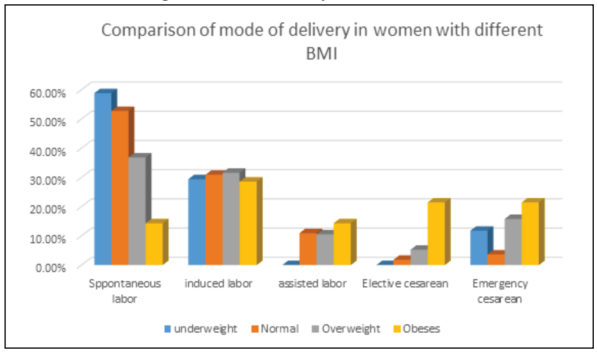

Figure 2:- Comparison Of The Mode Of Delivery In Women With Different BMI

The above graph depicts the comparison of mode of delivery in women with different BMIs. We concluded that elective cesarean and emergency cesarean were more common with obese women whereas most of the normal weighted and underweight women underwent spontaneous labor and induced labor.

Table 2: Correlation Of Maternal And Fetal Complications With BMI

BMI	Maternal complications		Fetal complications	
	PPH	Wound infection	Macrosomia	Shoulder dystocia
Under weight (<18.5)	5(26.32%)	4(33.33%)	0(0%)	0(0%)
Normal weight (18.5-24.9)	5(26.32%)	2(16.67%)	0(0%)	0(0%)
Over weight (25.0-29.9)	3(15.79%)	2(16.67%)	1(5.26%)	0(0%)
Obese (≥30)	6(31.58%)	4(33.33%)	2(14.29%)	1(7.14%)
P value	$\chi 2=10.340$.01 3 S	$\chi 2=9.840$.012 S	$\chi 2=9.100$.0 27 S	$\chi 2=6.56$ 0.08 NS

This table shows that maternal and fetal complications were more pronounced in overweight and obese groups.

Table 3:- Correlation of APGAR score with BMI

BMI	N	APGAR <7 (1 min)	APGAR <7 (5 min)	NICU Admission
Under weight (<18.5)	17	4(22.22%)	3(23.08%)	3(27.27%)
Normal weight (18.5-24.9)	55	4(22.22%)	2(15.38%)	2(18.18%)
Over weight (25.0-29.9)	19	4(22.22%)	3(23.08%)	2(18.18%)
Obese (≥30)	14	6(33.33%)	5(38.46%)	4(36.36%)
P value		$\chi 2=10.34$P= 0.011 S	$\chi 2=11.54$P= 0.009 HS	$\chi 2=8.56$ P=0.035

APGAR score was also found to be poor in obese women whereas out of 55 normal weighted women only 2 babies were admitted to NICU.

To conclude, a statistically significant increase in delivery by cesarean section was noticed, both emergency and elective. The increase in assisted labor rate has also been noticed. Babies also had an increased risk of poor APGAR scores with the increasing BMI of mothers.

DISCUSSION

There is evidence for metabolic dysregulation among obese individuals that have been linked with a number of possible environmental factors, including contaminants from modern industry. Obesity is a significant public health concern and is likely to remain so for the foreseeable future.[5]

Dyslipidemic changes may serve as the origins of a diverse array of diseases that arise later in life, including heart disease, hypertension, and non-insulin-dependent diabetes. [6]

Moreover, there are literature reports that the rates of induced labor are increasing worldwide. It is thought that induced labor is less efficient than spontaneous onset labor and therefore women who are induced are twice as likely to have a cesarean-section delivery or assisted delivery.

Because of fetal programming, obesity may become a self-perpetuating problem. Daughters of obese women may themselves be vulnerable to becoming obese and more likely to have offspring who share this vulnerability.[27]

In our study, 17 women were underweight, 55 were normal weight, 19 and 14 were overweight and obese respectively.

Among 17 underweight women, 5 women (26.32%) had PPH, 4 women (33.33%) had wound infection as maternal complications. No fetal complications were noted. Out of 55 normal weighted women, 5 women (26.32%) had PPH and 2 women (16.67%) had wound infection and no fetal complications were seen. In overweighed women 3 women (15.79%) had PPH and 2 women (16.67%) had wound infection and 1 woman (5.26%) had fatal complications in the form of macrosomia. In the obese group, 6 women (31.58%) had PPH, 4 women (33.33%) had wound infection, 2 women (14.29%) had babies born with macrosomia. This finding of our study is similar to **Sinha K et al**[10] who concluded that 7 newborns (i.e 13 %) babies were macrosomic.

Further in our study, it was found that 1 woman (7.14%) had a baby with shoulder dystocia. Lewis **DF et al** [28] tried to prospectively evaluate risk factors for shoulder dystocia. They found that 32% of cases occurred to obese (>90 kg) women and 25% of women experiencing shoulder dystocia had excessive maternal weight gain (>20 kg). There finding is similar to our study where shoulder dystocia was noted in the obese women group.

This indicates that obese women have more risk of maternal and fetal complications as compared to underweight and normal weighed women. Our findings are in accordance with **Kamalarani EA et al**[29] who in their study concluded that while comparing pregnant mothers with BMI >30 kg/m2 and normal BMI, they found that the prevalence of maternal and fetal complications was higher in the obese group. Prevalence of antenatal complications like gestational hypertension, preeclampsia, imminent eclampsia, and gestational diabetes mellitus requiring control with insulin was higher in obese women in their study.

In our study, it was observed that babies of only 4 women (22.22%) had APGAR score less than 7, 1 minute after birth and 3 women (23.08%) had APGAR score less than 7 when measured 5 minutes after birth, and babies of 3 women (27.27%) were admitted in NICU in underweighted women. In normal weighted women, babies of 4 women (22.22%) had APGAR score less than 7 at 1 minute and babies of only 2 women (15.38%) had less than 7 APGAR scores at 5 minutes, 2 babies (18.18%) were admitted in ICU.

In overweighted women group, babies of 4 women (22.22%) had APGAR score less than 7 when observed 1 minute after birth. Babies of 3 women (23.08%) had APGAR score less than 7, 5 minutes after birth, and 2 babies (18.18%) were admitted to NICU. In the obese group, babies of 6 women (33.33%) had APGAR score less than 7 after 1 minute of birth, and babies of 5 women (38.46%) had APGAR score less than 7 after 5 minutes of birth and 4 babies (36.36%) were admitted in NICU. This indicates that the risk of poor APGAR score and admission to NICU was more common in obese women. These findings of our study go in accordance with the studies done by **Nohr EA et al.**[30] and **Ovesen P et al.**[31] as they also concluded that neonates born to obese women have a higher rate of low APGAR score than those of normal-weighted women.

LIMITATIONS

The health consequences of obesity come from excess adipose tissue, not the size of one's body, but in our study, we used BMI to identify obesity, which refers to an individual's weight in kilograms divided by the square of his or her height in meters. the second limitation of our study is the small sample size.

CONCLUSION

In our study, we noted that maternal and fetal complications were more pronounced with the overweight and obese group. Babies also had an increased risk of poor APGAR scores with the increasing BMI of the mother.

Obstetricians and maternity staff should be aware that obese patients form a high-risk population and there is an increased incidence of cesarean section, perineal trauma, and postpartum hemorrhage. Effective intervention strategies, adequate precautions as well as availability of experienced obstetricians and pediatricians during birth in obese women is essential to decrease the risks of adverse intrapartum and perinatal complications in these women, Input of skilled birth attendants is essential to improve Intrapartum outcomes. Obesity in pregnancy can also affect health later in life for both mother and child.

According to the Royal college of obstetricians and gynaecologists recommendation, all the women with BMI ≥30 should receive preconception counseling to optimize their weight before pregnancy. Nurses, nurse midwives, other health workers and doctors can provide preconception counseling to these obese women and can give them information about the risk related to over weight or obesity.

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