

**ORIGINAL RESEARCH**

**A STUDY ON THE EFFECT OF OBESITY ON PREGNANCY  
OUTCOME**

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**ABSTRACT**

**Background:** To evaluate the risks to mother and the baby when pregnancy is associated with obesity.

**Materials and Methods:** A Prospective Comparative study conducted at Government medical college attached to Government General Hospital, Kadapa, affiliated to Dr. NTRUHS from October 2019 to September 2020 for a period of 1 year.

**Results:** In the study group 100 obese women with BMI $\geq$ 30 kg/m<sup>2</sup> and in the control group normal BMI between 18.5-24.9 Kg/m<sup>2</sup> were included in the study. 28% belonged to age group of 25-30 years in the study group as compared to 17% in the control group. Obese women were older than non-obese women. 45% of the obese women and 53% women in the control group belonged to low socio economic class V. 31% obese women and 35% non-obese women were primigravida. 69% women in the study group were multigravida. As the parity increases, Obesity tends to increase. The percentage of women in the study group belonged to class I, class II and class III obesity was 81%, 18%,1% respectively. The Incidence of Gestational Diabetes Mellitus in the study group is 14% and 2% in control group, with a statistically significant p value of 0.008. The incidence of Gestational Hypertension in the study group was 39% and in the control group was 11%. The incidence of preeclampsia in obese women was 17% and in control group was 2%. The incidence of Antepartum Haemorrhage; abruptio placenta in the study group and control group was 0%,1% respectively; whereas incidence of placenta previa was 1% and 0% in study group and control group respectively, which is not statistically significant. PPROM seen in 2% of women in study group and 5% of women in the control group which has no statistical significance. The main indication for primary caesarean section in the study group was Cephalopelvic Disproportion

**(20%). Majority of newborns in study group (58%) belonged to birth weight of 3-3.9kgs. Macrosomia was seen in 4% in study group as compared to 0% in control group. The rates of NICU admissions were 8% in the study group and 2% in the control group.**

**Conclusion: We conclude that, Pre conceptional counseling is the best time to create awareness regarding the complications of obesity in pregnancy and therefore dietary interventional measures to be started at this period. Awareness among reproductive age group women about the importance of normal weight before pregnancy to be done.**

**Keywords: Macrosomia, NICU, Antepartum Haemorrhage, PPROM, Placenta Previa.**

## **INTRODUCTION**

Pregnancy is considered unique to each woman, physiologically normal episode in women's life. Obesity is the one pre-existing maternal comorbidity that makes a pregnancy a high risk one. Increasing prevalence of obesity is a major problem in obstetrics practice. In both developing and developed countries, the prevalence of obesity has increased so much over the past two decades. As the incidence of obesity is increasing, most of the women are overweight or obese at the time of conception. In India, the prevalence of obesity in pregnancy was over 40% in 31 districts with highest prevalence of 72% seen in Shupiyan district of Jammukashmir.<sup>[1]</sup> Over the last 19 years first trimester maternal obesity has more than doubled from 7.6% to 15.6%.<sup>[2]</sup> According to WHO (World Health Organization), Worldwide obesity has nearly tripled since 1975. In 2016, more than 1.9 billion adults, 18 years and older, were overweight of these over 650 million were obese. 39% of adults aged 18 years and over were overweight in 2016, and 13% were obese.<sup>[3]</sup> More than 135 million individuals were affected by obesity in India.<sup>[4]</sup>

The main factors for the rapid rise of epidemic of obesity are urbanisation, demographic changes, rural to urban migration, faulty diets, sedentary lifestyle, high carbohydrate food content, socio cultural factors along with genetic predisposition. Advanced maternal age, lower educational level, low socio economic status and multiparity were associated with an increased risk of obesity in pregnancy.<sup>[5]</sup>

Pregnancy per se is not fattening, except temporarily. Maternal obesity is independent risk factor for adverse outcomes on the mother, fetus and the newborn such as miscarriage, Gestational Diabetes Mellitus, hypertensive disorders, venous thromboembolism, increased Caesarean delivery, anaesthetic complications, perioperative morbidity, and in fetus are macrosomia, congenital anomalies, small for gestational age, still birth, birth injuries-shoulder dystocia and in newborn- metabolic disorders. Obesity is a curse of modern lifestyle which has far reaching effects in terms of increased risk of medical disorders like diabetes and hypertension at a young age, infertility and poor pregnancy outcomes.<sup>[6]</sup> The purpose of this study was to examine the association between obesity in pregnancy and its obstetric and neonatal outcome. Pre-conceptional counselling is essential to educate the patient about the impact of obesity on pregnancy outcome and to encourage them to maintain a healthy lifestyle and body habitus. The present study is conducted at a tertiary care centre, Government Medical College associated with Government General Hospital, Kadapa loaded with so many patients serving the poor people. On an average around 10,000-12,000 pregnant women attending the antenatal out-patient department and around 9,000-10,000 deliveries

were conducted at this hospital per year. All the facilities needed for managing the complications associated with obesity in pregnancy are present in this institution, therefore chosen the present study.

### **Aims and objectives**

**Aims:** To evaluate the risks to mother and the baby when pregnancy is associated with obesity.

### **Objectives**

#### **1) Primary**

To estimate the risks to mother and the baby when pregnancy is associated with obesity.

#### **2) Secondary**

- To find out the incidence of Gestational Diabetes Mellitus, Hypertensive disorders of pregnancy among obese pregnant women.
- To find out the frequency of induction of labour and need of caesarean section.
- To find out the other co morbid conditions associated with obesity in pregnancy.

### **MATERIALS & METHODS**

A Prospective Comparative study conducted at Government medical college attached to Government General Hospital, Kadapa, affiliated to Dr. NTRUHS from October 2019 to September 2020 for a period of 1 year.

**Ethical Approval:** The present study is conducted after obtaining permission from institutional ethics Committee, Government Medical College & Government General Hospital, Kadapa (Annexure-II).

**Study Population:** A Total of 136 obese pregnant women attending antenatal outpatient department were taken in the study. Out of these 6 were registered beyond the first trimester, 10 were twin gestation, 10 had previous history of hypertension, 10 had previous history of diabetes mellitus. 36 pregnant women were excluded from the study and the final study population is 100.

#### **Inclusion Criteria**

1. Antenatal women who were in first trimester with BMI more than and equal to 30kg/m<sup>2</sup> regardless of age and parity, who were willing to participate in the study.

#### **Exclusion Criteria**

1. Women whose BMI < 30 kg/m<sup>2</sup>.
2. Antenatal women who were registered beyond first trimester.
3. Previous history of diabetes mellitus.
4. Previous history of hypertension before pregnancy.
5. Twin gestation.

**Method of Study:** Based on predefined inclusion and exclusion criteria, hundred obese pregnant women were recruited to the study group and compared with hundred normal weight pregnant women (Control Group). Pregnant women were allotted according to the classification of obesity in the study group.

CLASS I BMI 30 to 34.9 Kg/m<sup>2</sup>

CLASS II BMI 35 to 39.9 Kg/m<sup>2</sup>

CLASS III BMI ≥ 40Kg/m<sup>2</sup>

All Participants were explained about the nature and purpose of the study and written informed consent was taken (Annexure-III). Structured proforma (Annexure-I) was made, distributed among all the postgraduates informed regarding the present study and asked to enter the required details of antenatal women attending outpatient department with obesity complicating pregnancy. In all antenatal women, relevant haematological, biochemical investigations, USG were done. All the pregnant women were followed up to delivery and postpartum period till discharge from hospital. Maternal and perinatal outcome were studied. Physical examination was done in detail like weight, height, pulse rate, temperature, blood pressure, along with systemic examination of respiratory system, cardiovascular system, central nervous system and obstetric examination was done.

They were looked for development of Gestational hypertension, preeclampsia, Gestational Diabetes Mellitus. Induction of labour and its indication, mode of delivery (vaginal, instrumental, caesarean section), intrapartum complications like shoulder dystocia, complete perineal tear, postpartum haemorrhage were recorded. Postpartum complications like fever, wound infections, wound dehiscence, Deep vein thrombosis were recorded. Among neonates, Gestational age at delivery, birth weight, APGAR score at 1 minute and 5 minutes, admissions in NICU and their indications, any congenital anomalies were analyzed.

**Statistical Analysis:** Data was collected from both study and control groups and systematically transferred to Microsoft Excel 2019. Statistical analysis were performed using SPSS version 21. Differences between the groups were evaluated using the chi-square test and  $p < 0.05$  was considered statistically significant.

## RESULTS

100 Pregnant women with BMI  $\geq 30$  kg/m<sup>2</sup> taken as the study group and 100 pregnant women with BMI between 18.5 - 24.9 kg/m<sup>2</sup> taken as the control group were included in the study.

**Table-1: Age Wise Distribution**

Age	Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
18-20	1	1 %	4	4 %
20-25	58	58 %	73	73 %
25-30	28	28 %	17	17 %
30-45	13	13 %	6	6 %

Chi Square = 8.785, P VALUE = 0.032 (S)

[Table-1]: shows the age distribution in both study and control group. 58% women in the study group and 73% women in the control group belonged to the age group of 20-25 years, which shows no statistical significance. 28% women in study group belonged to the age group of 25-30 years.

**Table-2: Socio-Economic Class**

Socio-Economic Class	Study Group (Bmi $\geq$ 30 Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
Iii	11	11 %	7	7 %
Iv	44	44 %	40	40 %
V	45	45 %	53	53 %

Chi Square = 1.732, P VALUE = 0.421 (NS)

[Table-2]: shows socio-economic class in both study and control group. 45% in the study group and 53% in the control group belonged to socio-economic class V.

**Table-3: Parity Distribution**

	Study Group (Bmi $\geq$ 30 Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
PRIMI	31	31 %	35	35 %
G2, G3	63	63 %	59	59 %
G4 And Above	6	6 %	6	6 %

Chi Square = 0.374, P VALUE = 0.830 (NS)

[Table-3]: shows parity distribution in both study and control group. 31% in the study group and 35% in the control group were primigravida. 69% in the study group and 65% in the control group were multigravida.

**Table-4: Classification of Obesity in Obese Women**

Obesity	Number	Percentage
Class I	81	81 %
Class Ii	18	18 %
Class Iii	1	1 %

[Table-4]: shows classification of obesity in obese women. 81% belonged to class I, 18% belonged to class II, and 1% belonged to class III.

**Table-5: GDM (Gestational Diabetes Mellitus)**

Gdm	Study Group (Bmi $\geq$ 30 Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
Meal Plan	7	7 %	1	1 %
Insulin	7	7 %	1	1 %
No Gdm	86	86 %	98	98 %

Chi Square = 9.783, P VALUE = 0.008 (S)

[Table-5]: shows incidence of Gestational Diabetes Mellitus in study and control group. The incidence of GDM is 14% in the study group as compared to 2% in the control group which was statistically significant with a p value of 0.008.

**Table- 6: Gestational Hypertension**

Gestational Hypertension	Study Group (Bmi $\geq$ 30 Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No	%	No	%
Gestational Hypertension	39	39 %	11	11 %
No	61	61 %	89	89 %

Chi Square = 20.907, P VALUE = 0.001 (S)

[Table-6]: shows the incidence of Gestational Hypertension in study and control group. 39% of the women in the study group and 11% women in the control group had Gestational Hypertension which is statistically significant with a p value of 0.001.

**Table-7: Pre-Eclampsia**

Pre-Eclampsia	Study Group (Bmi $\geq$ 30 Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No	%	No	%
Mild Pre-Eclampsia	9	9 %	2	2 %
Severe Pre-Eclampsia	8	8 %	1	1 %
No Pre-Eclampsia	83	83 %	97	97 %

Chi Square = 10.988, P VALUE = 0.004 (S)

[Table-7]: shows the incidence of preeclampsia in study and control group. 17% of the women in the study group and 3% women in the control group had preeclampsia which is statistically significant with a p value of 0.004.

**Table-8: Antepartum Haemorrhage**

Antepartum Haemorrhage	Study Group (Bmi $\geq$ 30 Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )		P Value
	No.	%	No.	%	
Abruption	0	0 %	1	1 %	.316
Placenta Previa	1	1 %	0	0 %	.316

[Table-8]: shows the incidence of Antepartum Haemorrhage in the study and control group. The incidence of Abruption and Placenta Previa is almost similar in both the groups which were not statistically significant.

**Table-9: Preterm Labour and Preterm Premature Rupture of Membranes (Pprom)**

Preterm Labour And Pprom	Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )		P Value
	No.	%	No.	%	
Preterm Labour	19	19 %	7	7 %	.012
Pprom	2	2 %	5	5 %	.248

[Table-9]: shows the incidence of Preterm labour and PPRM in study and control group. The incidence of Preterm labour is 19% in the study group and 7% in the control group.

**Table-10: Fetal Presentation**

Fetal Presentation	Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
Vertex	95	95 %	98	98 %
Breech	5	5 %	1	1 %
Transverse Lie	0	0 %	1	1 %

Chi Square = 3.713, P VALUE = 0.156 (NS)

[Table-10]: shows that 95% in the study group and 98% in the control group had vertex presentation. 5% in the study group and 1% in the control group had breech presentation. 0% in the study group and 1% in the control group had transverse lie with no statistical significance.

**Table-11: Induction of Labour**

Induction of Labour	Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
Yes	26	26 %	14	14 %
No	74	74 %	86	86 %

Chi Square = 4.500, P VALUE = 0.034 (S)

[Table-11]: shows that 26% of the women in the study group and 14% in the control group required induction of labour with statistically significant p value of 0.034.

**Table-12: Mode of Delivery**

Mode of Delivery	Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
Labour Normal	23	23	79	79
Outlet Forceps	2	2	1	1
C-Section	75	75	20	20

Chi Square = 62.921, P VALUE = 0.001 (S)

[Table-12]: shows the mode of delivery in study and control group. The incidence of Caesarean section was 75 % in study group and 20 % in control group .23% in the study group and 79% in the control group had Normal Vaginal delivery, 2% in the study group and 1% in the control group had instrumental delivery, with a statistically significant p value of 0.001.

**Table-13: Indications of Caesarean Section**

Indications of C-Section	Study Group (Bmi $\geq$ 30 Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
Cpd	15	20 %	4	20%
Contracted Pelvis	4	5.3%	2	10%
Failed Induction	5	6.7 %	2	10 %
Failed Progression	5	6.7 %	0	0
Fetal Distress	4	5.3 %	3	15%
Fpd	0	0	1	5 %
Severe Oligohydramnios	5	6.7 %	2	10%
Transverse Lie	0	0	1	5 %
Oblique Lie	1	1.3 %	0	0
Iugr With Breech	1	1.3%	0	0
Placenta Previa	1	1.3 %	0	0
1 Prior C-S	29	38.7 %	5	25%
2 Prior C-S	5	6.7 %	0	0

[Table-13]: shows 20% in the study group had CPD. The most common indication of primary Caesarean section was CPD in study group.

**Table-14: Birth Weight**

Birth Weight	Study Group (Bmi $\geq$ 30 Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
<2 Kgs	2	2 %	2	2 %
2-2.9 Kgs	36	36 %	49	49 %
3-3.9 Kgs	58	58 %	49	49 %
>4 Kgs	4	4 %	0	0 %

Chi Square = 6.745, P VALUE = 0.080 (NS)

[Table-14]: shows 58% of babies in the study group and 49% in the control group belonged to birth weight 3-3.9Kgs. The incidence of Macrosomia was 4% in study group and 0% in control group, which shows no statistical significance.



**Table-15: NICU Admissions**

Nicu Admissions	Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
Yes	8	8 %	2	2 %
No	92	92 %	98	98 %

Chi Square = 3.789, P VALUE = 0.052 (NS)

[Table-15]: shows 8% babies in the study group and 2% babies in the control group required NICU admissions.

**Table-16: Post-Partum Complications**

Post-Partum Complications	Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )		P Value
	No.	%	No.	%	
Wound Infections	11	11 %	0	0 %	.001
Wound Dehiscence	0	0 %	0	0 %	-
Dvt	0	0 %	0	0 %	-
Pph	0	0 %	0	0 %	-

[Table-16]: shows the incidence of wound infections in study group was 11% as compared to 0% in the control group with a statistically significant P value of 0.001.

**Table-17: Duration of Hospital Stay**

		Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
		No.	%	No.	%
Vaginal Delivery	2 Days	16	69.6 %	72	91.1%
	>2 Days	7	30.4 %	7	8.9%
C-Section	7 Days	59	78.7 %	19	95 %
	>7 Days	16	21.3 %	1	5 %

[Table-17]: shows incidence of duration of hospital stay in study and control group. Among normal vaginal deliveries, mean duration of hospital stay was 2.65 days in study group and 2.18 days in control group. Among C-section deliveries, mean duration of hospital stay was 7.95 days in study group and 7.15 days in control group.

**Table-18: Fetal Outcome**

Fetal Outcome	Study Group (Bmi $\geq 30$ Kg/M <sup>2</sup> )		Control Group (Bmi 18.5-24.9 Kg/M <sup>2</sup> )	
	No.	%	No.	%
Live Birth	100	100 %	99	99 %
Iud	0	0 %	1	1 %

[Table-18]: shows the incidence of Live birth is 100% in the study group and 99% in the control group.

## **DISCUSSION**

The current obesity epidemic is one of today's biggest health challenges globally with a direct impact on women's life during their reproductive years. In the present generation, sedentary life style, smoking, late age pregnancies are becoming higher and adversely affecting the pregnancy outcomes. Obesity complicates the process of child bearing and child birth.

The present study adds to the evidence that obesity in pregnancy is associated with adverse health outcomes for both mother and fetus like increased risk of Gestational Diabetes Mellitus, Gestational Hypertension, preeclampsia, induction of labour, caesarean section, wound infections, longer duration of hospital stay.

### **Age Wise Distribution**

In my study 58% women in the study group and 73% women in the control group belonged to the age group of 20 to 25 years. In the study group and control group, 28% and 17% women belonged to the age group of 25-30 years respectively. 13% of women in the study group and the 6% of women in control group were more than 30 years. 1% and 4% of women respectively in the study group and control group were less than 20 years. This showed that incidence of obesity increases with age.

In a study by Vanlalfeli et al,<sup>[7]</sup> majority of obese women belonged to 20-25 years. According to Vernini et al,<sup>[11]</sup> study, overweight and obesity was observed predominantly among pregnant women  $\geq 35$  years.

According to Sinha K et al,<sup>[12]</sup> study, majority of the Obese Women, 40% belong to 20-25 Years.

### **Socio-Economic Status**

In my study, the majority of women belonged to low socioeconomic class V 45%, 53% in study group and control group respectively.

This shows that obesity in pregnancy is disproportionately a problem of the poor and further research needs to be done to know the exact interrelationship between socio economic status and obesity.

According to Vanlalfeli et al,<sup>[7]</sup> study majority of the participants belonged to class III socio economic status, 72% in obese women and 60% in control women respectively. According to Singh p. et.al (2017), 50%, 37.5%, 8.3%, 4.2% belonged to socio economic class I, II, III, IV respectively.

### **Obesity Classification**

According to obesity classification, 81% of women belonged to class I, 18% of women belonged to class II and 1% of women in class III obesity. In my study majority of obese women was within class I (BMI: 30-34.9kg/m<sup>2</sup>).

According to the Prameela H.J et al,<sup>[13]</sup> study 66.07% women belonged to class I, 23.2% belonged to class II, and 10.7% women belonged to class III obesity.

### **Parity**

In my study 31% of women in the study group and 35% of women in the control group were primigravida. 69% of obese women were multigravida with 6% among them were grand multigravida. This showed that multigravida is more obese than primigravida.

Inigomelchor et al,<sup>[10]</sup> study showed that 48.02% of the study group were primigravida remaining 51.98% were multigravida.

According to Vanlalfeli et al,<sup>[7]</sup> study, 40% were primigravida among the study group and 37% were multigravida.

According to Sinha K et al,<sup>[12]</sup> study, 27.3% were primigravida and 72.7% were multigravida with 18.2% among them were grand multi gravida.

My study results were in concurrence with the Sinha K et al,<sup>[12]</sup> Study that Multi Gravida are more obese than Primi Gravida and in accordance with the Ehrenberg H M et al (2002),<sup>[20]</sup> study, that risk factors for obesity are increasing age and parity.

### **Gestational Diabetes Mellitus**

In my study, the incidence of Gestational Diabetes Mellitus was 14% in the study group and 2% in the control group, with a significant p value of 0.008. This showed that increased risk of developing Gestational Diabetes Mellitus in obese women.

In Inigomelchor et al,<sup>[10]</sup> study incidence of Gestational Diabetes Mellitus was 5.02%. where as in study by Vanlalfeli et al,<sup>[7]</sup> incidence of Gestational Diabetes Mellitus was 10.39%.

According to Imran Kutchi et al,<sup>[9]</sup> study, the incidence of Gestational Diabetes Mellitus was 35% in the obese women compared to 10% in non-obese women whereas in a study by Esther et al,<sup>[8]</sup> the incidence of Gestational Diabetes Mellitus was 15%. In Vernini et al,<sup>[11]</sup> study incidence of Gestational Diabetes Mellitus was 39.4% in obese women as compared to 12.3% in non-obese women.

In Pameela H J et al,<sup>[13]</sup> study, incidence of Gestational Diabetes Mellitus was 5.3%. In Shin Y Kim et al,<sup>[17]</sup> study percentage of GDM in obesity, extreme obesity were 9.7% and 21.1% respectively.

### **Gestational Hypertension**

In my study incidence of Gestational Hypertension is 39% in study group and 11% in the control group.

According to Vanlalfeli et al,<sup>[7]</sup> the incidence of gestational hypertension was 20.78%.

According to Imran Kutchi et al,<sup>[9]</sup> study, incidence of Gestational Hypertension was 11.76% in study group as compared to 6.12% in control group.

### **Preeclampsia**

In my study incidence of preeclampsia in the obese women was 17% as compared to 3% in the control group. This shows that obesity is a risk factor for developing hypertensive disorders of pregnancy. This is in accordance with the study conducted by O'Brien et al (2003),<sup>[21]</sup> that with each 5-7 kg/m<sup>2</sup> increase in pre pregnancy Body Mass Index (BMI) the risk of pre eclampsia is typically doubled.

According to Inigo melchor et al,<sup>[10]</sup> study incidence of pre eclampsia in obese group was 1.58%. According to Vanlalfeli et al,<sup>[7]</sup> the incidence of severe pre eclampsia in the obese group was 3.9%. According to Imran Kutchi et al,<sup>[9]</sup> study, incidence of pre-ecalmpsia was 16.67% as compared to 2.13% in control group. It was 42.8% in a study conducted by Pameela H J et al (2017).<sup>[13]</sup>

### **Antepartum Haemorrhage**

In my study the incidence of abruption is 0% in study group compared to 1% in control group. The incidence of placenta previa is 1% in obese group with no statistical significance. According to Inigomelchor et al,<sup>[10]</sup> study incidence of antepartum haemorrhage was 0.63% According to Salihu et al,<sup>[19]</sup> study concluded that obesity is less likely to cause antepartum haemorrhage (1%). According to Arditi et al,<sup>[22]</sup> study showed that obese women with placenta previa were more likely to have increased maternal morbidity compared to non-obese women.

### **Preterm Labour and Preterm Premature Rupture of Membranes (Pprom)**

In my study, the incidence of preterm labour and PPRM is 19% and 2% respectively in the study group as compared to 7% and 5% respectively in control group.

According to Inigo melchor et al,<sup>[10]</sup> study the incidence of preterm labour was 6.66% where as in study by vanlalfeli et al.<sup>[7]</sup> the incidence of preterm delivery was 6.49% and it was 7% in the study by Esther et al.<sup>[8]</sup> According to Hendler et al,<sup>[23]</sup> study concluded that obesity in pregnancy is associated with lower rates of spontaneous preterm birth. According to Sven Cnattinguis et al,(2013) study showed that obesity in pregnancy is associated with increased risk of preterm delivery.

### **Fetal Presentation**

In my study, incidence of Vertex Presentation is 95% in study group and 98% in control group. Incidence of breech presentation in study group and control group were 5%, 1% respectively whereas incidence of transverse lie is 0%, 1% in study group and control group respectively.

This shows that obesity is not a risk factor for malpresentation in the present study. My study is in accordance with Inigomelchor et al,<sup>[10]</sup> study, the incidence of breech presentation was 2.89% .According to Vanlalfeli et al,<sup>[7]</sup> study, the incidence of transverse lie was 1.3%.

My study is not in accordance with the study conducted by Heslehurst et al,<sup>[24]</sup> showed increased risk of malpresentation in obese group.

### **Induction of Labour**

The incidence of induction of labour in study group is 26% as compared to control group that is 14% which is statistically significant with a p value of 0.034.

In Inigomelchor et al,<sup>[10]</sup> study, the incidence of induction of labour was 38.69%. According to Vanlalfeli et al,<sup>[7]</sup> the incidence of induction of labour was 31.17%, where as in study conducted by Imran Kutchi et al,<sup>[9]</sup> the incidence of induction of labour was 62.5%.

In a study by Prameela H J et al,<sup>[13]</sup> the incidence of induction of labour was 27.5%, whereas according to Esther et al,<sup>[8]</sup> study the incidence of induction of labour was 42.9%.

My study is in consistent with the results of Arrow smith et al,<sup>[14]</sup> study (48.6%) and most of the studies which showed that obese women are at increased rates of induction of labour.

### **Mode of Delivery**

In my study, the incidence of caesarean section is higher in study group that is 75% as compared to 20% in control group with a statistically significant p value of 0.001. In my study the incidence of forceps in study group and control group is 2%, 1% respectively.

My study results were in concurrence with the study conducted by Vanlalfeli et al,<sup>[7]</sup> where the incidence of vaginal delivery is 36.36% and caesarean section is 63.64 % and study by

vernini et al,<sup>[11]</sup> the incidence of vaginal delivery and caesarean section in obese group were 27.6% and 72.4 % respectively.

My study results were not in accordance with the study of prameela H J et al,<sup>[13]</sup> where the incidence of caesarean section is 48.2 % and vaginal delivery is 51.7% in obese women and study by Imran kutchi et al,<sup>[9]</sup> Vaginal deliveries and Caesarean section were 60.4% and 39.56% respectively. According to Inigomelchor et al,<sup>[10]</sup> study, the incidence of Primary Caesarean Section was 25.37% in obese women compared to 10.06% in non-obese women.

### **Wound Infection**

The incidence of postpartum wound infection in my study was 11% in the study group and 0% in control group. Our results were supported by the studies done by Vanlalfehi et al 2018,<sup>[7]</sup> (0 % in controls ; 6.49 % in obese ).

According to Leth et al,<sup>[15]</sup> study the incidence of wound infection was 18.4% where as in the study by Hood et al,<sup>[25]</sup> incidence of wound infection was 9%.

Studies by Norman et al,<sup>[26]</sup> and vermilion et al,<sup>[18]</sup> showed increased rates of postpartum wound infection in obese pregnant women.

The higher rates of wound infections are due to overhanging fold of subcutaneous tissue, area under the panniculus exposed to moist and anaerobic environment.

### **Deep Vein Thrombosis**

In my study no case of Deep Vein Thrombosis was noted, which is not in concurrence with the hood et al,<sup>[25]</sup> study the incidence of Deep Vein Thrombosis was 2.5%.

### **Postpartum Haemorrhage**

In my study no cases of Postpartum Haemorrhage was noted, as active management of third stage of labour (AMTSL) was done effectively. My study is not in concurrence with the Elaine M Fyfe et al,<sup>[27]</sup> study the incidence of postpartum haemorrhage was 32.2 %, where as in Imran Kutchi et al,<sup>[9]</sup> study the incidence of postpartum haemorrhage was 25.2 %.

According to Prameela H J et al,<sup>[13]</sup> study the incidence of postpartum haemorrhage was 8.9%, where as in Esther et al,<sup>[8]</sup> study the incidence of postpartum haemorrhage was 2 % and Blomberg et al,<sup>[16]</sup> study the incidence of postpartum haemorrhage was 1.8%.

The factors responsible for increased incidence of PPH in different studies are increased surface area of implantation of Placenta, large volume of distribution, decreased bioavailability of uterotonic agents.

### **Birth Weight of Neonate**

In my study, the majority of new borns were born with Birth weight between 3-3.9kgs (58%). Macrosomia was seen in 4% in study group and 0% in control group.

According to prameela H J et al,<sup>[13]</sup> study the incidence is 19.6 % of Birth weight > 3.5 kgs. Vanlalfehi et al,<sup>[7]</sup> study, 90.91% new borns were between  $\geq 2.5$  kgs.

My study results were in concurrence with the evidence of following studies that there is an increased prevalence of macrosomia in obese pregnant women.

In Vernini et al,<sup>[11]</sup> study 89% of new borns were between 2.5 kgs-3.9 kgs. macrosomia seen in 9.4 % of obese women.

According to Sinha K et al,<sup>[12]</sup> the incidence of macrosomia was 12.72% whereas in study by Inigomelchor et al,<sup>[10]</sup> the incidence of macrosomia was 12.6%. According to Hood et al,<sup>[25]</sup> the incidence of macrosomia was 26%.

### **Nicu Admission Rates**

In my study, the incidence of NICU admission rates was 8% in the study group compared to 2 % in the control group which is not statistically significant.

My study results were in concurrence with Inigomelchor et al,<sup>[10]</sup> study the incidence of admission to NICU was 7.79%. According to Prameela H J et al,<sup>[13]</sup> the incidence of admission in NICU is 23.2 % in the obese group.

According to Imran Kutchi et al,<sup>[9]</sup> study the rate of admissions in NICU was 17.39%, where as in Vanlalfehi et al,<sup>[7]</sup> study the rate of admissions in NICU was 38.96%.

### **Duration of Hospital Stay**

In my study, the mean duration of hospital stay among study group in caesarean delivery was 7.95 days and vaginal delivery was 2.65 days and in control group it was 7.15 days and 2.18 days for Caesarean section and vaginal delivery respectively.

According to Hood et al,<sup>[25]</sup> and Nicole et al (2010) study, showed that prolonged hospital stay is needed for obese women.

### **CONCLUSION**

At the beginning of the century, obesity was not terribly problematic with few exceptions. Fast forward today, obesity is a major health problem globally. Obese gravidas and their fetuses are predisposed to serious pregnancy related complications like Gestational Diabetes Mellitus, preeclampsia, Gestational hypertension, increased rates of induction of labour, increased caesarean section and prolonged duration of hospital stay, increased NICU admissions rate. The adverse health aspects of obesity are staggering. It includes risks for diabetes mellitus, heart disease, hypertension, stroke and osteoarthritis in later life. Awareness of these detrimental effects of obesity is to be made to all healthcare workers. Knowledge to be given to obese women about lifestyle interventions and physical activity are a part of management of obesity in pregnancy to reduce the associated risks and complications. To stop this growing health problem globally, effective anti-obesity strategy should be implemented at national level and worldwide. Obesity in pregnancy is preventable as it is a modifiable risk factor. In child bearing age group the health and economic impact of rising obesity rates is of greater public health importance. Further research is required to know about the exact mechanisms how obesity adversely affects the pregnancy and how it can be prevented. Pre conceptional counseling is the best time to create awareness regarding the complications of obesity in pregnancy and therefore dietary interventional measures to be started at this period. Awareness among reproductive age group women about the importance of normal weight before pregnancy to be done.

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