

## THE STUDY OF RISK FACTORS, MATERNAL AND PERINATAL OUTCOME IN OBESITY COMPLICATING PREGNANCY IN A TERTIARY CARE HOSPITAL

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### Abstract

**Background:** Maternal obesity was defined according to the World Health Organization (WHO) and National Institute of Health Guidelines (NIHG) as follows: overweight BMI 25-29.9 kg/m<sup>2</sup>, obesity >30 kg/m<sup>2</sup>. Obstetrics practice is facing a major challenge due to increase in maternal obesity. Worldwide prevalence of obesity has increased substantially over the past few decades. Maternal obesity is reaching epidemic proportions in recent times. **Materials and Methods:** Prospective study was conducted in 100 patients from Dec 2020 to Dec 2022 in the department of obstetrics and Gynecology, Government General Hospital, Kurnool. Pregnant mothers were selected according to inclusion criteria, detailed history was taken followed by general and physical examination. Relevant hematological, biochemical investigations, USG will be done and the pregnant mother will be followed until postpartum period and outcome will be analyzed. **Result:** Total 100 pregnant women were included in the study. Among them 50 women were obese and 50 women have normal BMI. In the case group 36% were moderately obese, 36% were severely obese and only 8% were morbidly obese. Majority of pregnant women were between 21-24 years (42% each) both in cases and controls. Proportion of women in the age group >30 years were 12% in obese group and 4% in control group. This difference in age group distribution was statistically significant. Among vaginal delivery group 10% of obese women and 4% of control women required prolonged hospital stay (>2 days). It was not statistically significant. Among cesarean delivery group 20% of obese women and 2% of control women required prolonged hospital stay (>7 days) which was significant. **Conclusion:** Maternal obesity adversely impacts pregnancy outcome, primarily through increased rates of hypertensive disease (chronic hypertension, preeclampsia, eclampsia) GDM, caesarean sections, wound infections, it is also associated with higher rates of DVT, preterm deliveries, anemia and hypothyroidism in, mother. Higher rates of NICU admissions, preterm babies were the problems in newborn. Given the current obesity epidemic and the adverse outcome, women should restore to the normal BMI well before planning pregnancy.

## INTRODUCTION

Maternal obesity was defined according to the World Health Organization (WHO) and National Institute of Health Guidelines (NIHG) as follows: overweight BMI 25-29.9kg/m<sup>2</sup>, obesity >30 kg/m<sup>2</sup>.<sup>[1]</sup>

Obstetrics practice is facing a major challenge due to increase in maternal obesity.

Worldwide prevalence of obesity has increased substantially over the past few decades.

Maternal obesity is reaching epidemic proportions in recent times.

Body Mass Index (BMI) is an accepted method of measuring obesity. BMI, also known as Quetelet index is a statistical measure that compares a person's weight for height and doesn't actually measure body fat.<sup>[2]</sup>

Obesity is an individual and public health issue, worldwide because it leads to development of several chronic diseases. Pregnancy is unique, yet a normal physiological chapter in women's life, however preexisting morbidity like obesity in the mother may make it a high risk one.<sup>[3]</sup>

Impact of maternal obesity on pregnancy complications have been studied as early as 1945. Since then several studies have reported a clear association between maternal obesity and adverse fetomaternal outcomes.<sup>[4]</sup>

In India The National Family Health Survey -III B, which includes the health of women of child bearing age, reports that 33% of women have a BMI below normal, 14.8% are overweight/ obese.

Factors such as dietary knowledge attitude and practices, physical activity level and socio demographic and health behavior factors are likely reasons for increase in prevalence of overweight/ obesity.

Antenatal complications in obese pregnant women include pregnancy induced hypertension, preeclampsia, GDM, Venous thromboembolism, recurrent miscarriages and congenital malformations. Overweight and Obese women are more likely to end up induction of labour or operative deliveries. Obese pregnant women have higher risk of hypertension, gestational diabetes mellitus (GDM), Cesarean section, shoulder dystocia and early neonatal death. Obesity in pregnancy compromises fetal metabolic programming, increasing the risk of obesity, diabetes and cardiovascular disorders in the offspring. Gestational Diabetes and preeclampsia are the major maternal risks whereas fetus is at risk of congenital anomalies and still births in obese pregnant mothers. Maternal obesity is associated with Long term negative outcomes both for the mother and the child.<sup>[5]</sup>

Mother may suffer from diabetes, hypertension, heart disease in the long run. Child may have risk of future heart disease, obesity and diabetes.

Since pregnancy can serve as a triggering or aggravating factor for obesity, diagnosing and monitoring the weight status of pregnant women should be a routine prenatal care procedure. A number of factors, such as water retention, uterine growth, formation of fetal tissues and placenta, and increasing amniotic fluid volume, can limit the evaluation of maternal body mass index (BMI) during pregnancy. Maternal obesity is a co-morbidity in during pregnancy. This affects both mother and neonate, a vigilant care during antenatal, intrapartum and postpartum period may lead to better maternal and perinatal outcome.

#### **Aims and Objectives**

1. Effect of maternal obesity on maternal complications during antepartum intrapartum and postpartum period
2. Effect of maternal obesity on neonatal outcome.

3. Comparison of maternal and neonatal outcome in obese pregnant women with non-obese pregnant women.
4. To determine the risk factors in obesity complicating mothers.

## **MATERIALS AND METHODS**

Prospective study was conducted in 100 patients from Dec 2020 to Dec 2022 in the department of obstetrics and Gynecology, Government General Hospital, Kurnool.

**Study Design:** Prospective, observational study

**Duration of the study:** One and half year from March 2021 - august 2022.

**Sample Size:** 100 cases will be divided into two groups based on BMI  $\geq 30$  kg/m<sup>2</sup> as cases and BMI between 18.5 kg/m<sup>2</sup> and 25 kg/m<sup>2</sup> as controls.

**Target Population:** Antenatal mothers booked at first trimester in outpatient Department of Obstetrics and Gynecology, Government General Hospital, Kurnool.

#### **Inclusion Criteria**

1. Singleton pregnancies
2. Age > 18 years and < 40 years
3. Irrespective of socio-economic status.
4. Both nulliparous and multiparous are included.

Pregnant women with first trimester BMI > 30 kg/m<sup>2</sup> (CASES). Pregnant women with first trimester BMI between 18.5 kg/m<sup>2</sup> and 25 kg/m<sup>2</sup>. (Controls)

#### **Exclusion Criteria**

1. Multiple gestations.
2. Age < 18 years and > 40 years
3. Mothers not booked at first trimester.
4. Anomalous baby
5. Women with BMI between 25.1 kg/m<sup>2</sup> and 29.9 kg/m<sup>2</sup>
6. women with BMI < 18.5 Kg/m<sup>2</sup>
7. Miscarriage
8. Pregnant Women lost for follow up till delivery.

#### **Methodology**

Pregnant mothers were selected according to inclusion criteria, detailed history was taken followed by general and physical examination. Relevant hematological, biochemical investigations, USG will be done and the pregnant mother will be followed until postpartum period and outcome will be analyzed.

#### **Investigations Required**

Hematological investigation: Complete blood picture: Blood sugars:

Blood urea and serum creatinine: Thyroid profile: Lipid...profile: Urine albumin and sugars: HIV, HBsAg, HIV: Ultrasonography:

#### **Statistical Analysis**

Data collected will be entered in Microsoft excel. Frequencies are expressed as percentages. Continuous data will be expressed as means and standard deviation.

Tests of significance used are Chi square test. Statistical analysis will be done by using SPSS version 26. Level of significance is taken as  $p < 0.05$ .

## RESULTS

Total 100 pregnant women were included in the study. Among them 50 women were obese and 50 women have normal BMI.

In the case group 36% were moderately obese, 36% were severely obese and only 8% were morbidly obese. [Table 1]

**Table 1: Distribution According To BMI.**

BMI of cases	No. (%)	BMI of controls	No. (%)	P value
30-34.9	18 (36)	18.5-19.9	15 (30)	<0.001
35-39.9	28 (56)	20-22.5	13 (26)	
>40	4 (8)	23-25	22 (44)	
Total	50			

**Table 2: Maternal Age Distribution.**

Age (Years)	Cases no. (%)	Controls no. (%)	P value
<20	5 (10)	16 (32)	0.0479
21-24	21 (42)	21 (42)	
25-29	18 (36)	11 (22)	
30-34	2 (4)	1 (2)	
35-40	4 (8)	1 (2)	
Total	50	50	

**Table 3: Mean Maternal Age in Years**

Group	Total	Mean years	Standard deviation	Student t-test
Control	50	23.40	3.687	P<0.001
Obese	50	26.56	4.267	

**Table 4: Mean Maternal Weight.**

	Group	Total	Mean(kg)	Standard deviation	Student t-test
Weight at Booking	Control	50	50.32	6.409	P=0.001
	Obese	50	70.56	5.877	
BMI at Booking	Control	50	22.00	2.304	P=0.001
	Obese	50	33.06	2.094	
Weight at Delivery	Control	50	60.32	6.409	P=0.001
	Obese	50	81.32	5.597	

**Table 5: Distribution According To Socioeconomic Status**

Socioeconomic class	Cases No. (%)	Controls No. (%)	P Value
I	2 (4)	1 (2)	0.576
II	3 (6)	2 (4)	
III	8 (16)	5 (10)	
IV	18 (36)	15 (30)	
V	19 (38)	27 (54)	
Total	50	50	

**Table 6: Distribution According to Parity**

Parity	Cases No. (%)	Controls No. (%)	P value
Nullipara	4 (8)	11 (22)	0.001
Para1	8 (16)	9 (18)	
Para2	9 (18)	20 (40)	
Para3	23 (46)	6 (12)	
Para 4 or more	6 (12)	4 (8)	
Total	50	50	

Among obese women 8% were nulliparous and 92% were parous women, where as in control group 22% were nulliparous and 78% were parous women.

**Table 7: Distribution According to Menstrual Pattern**

Menstrual pattern	Cases No. (%)	Controls, No. (%)	P value
Regular	32 (64)	37 (74)	0.279
Irregular	18 (36)	13 (26)	
Total	50	50	

**Table 8: Infertility**

Infertility	Cases, No. (%)	Controls, No. (%)	
Yes	8 (16)	1 (2)	0.014
No	42 (84)	49 (98)	
Total	50	50	

**Table 9: Conceived By Assisted Reproduction Technique**

Conceived by Assisted reproduction technique	Cases No. (%)	Controls No. (%)	P Value
Yes	4 (8)	1 (2)	0.168
No	46 (92)	49 (98)	
Total	50	50	

**Table 10: Pre pregnancy Medical Disorders**

Medical disorders	Cases No. (%)	Controls No. (%)
Hypothyroidism	17 (34)	1 (2)
Asthma	1 (2)	1 (2)
Heart disease	1 (2)	0 (0)
Chronic hypertension	1 (2)	0 (0)
Deranged lipid profile	6 (12)	0 (0)
Family h/o obesity	16 (32)	0 (0)
Childhood obesity	16 (32)	0 (0)
PCOD	9 (18)	1 (2)
On heparin	1 (2)	0 (0)
On Insulin	5 (10)	0 (0)

**Table 11: Pregnancy Related Medical Disorders (Antepartum Complications)**

Antenatal Complications	Cases No%	Controls No%
Anaemia	5(10%)	9(18%)
Preeclampsia	18(36%)	4(8%)
Preeclampsia +GDM	17(34%)	1(2%)
GDM	13(26%)	2(4%)
Hyperemesis gravidarum	10(20%)	10(20%)
Abruptio placenta	3(6%)	1(2%)
Malpresentation	4(8%)	2(4%)

**Table 12: Distribution According to Fetal Presentation**

Fetal presentations	Cases No. (%)	Controls No. (%)	
Cephalic	36 (90)	38 (95)	0.697
Transverse	2 (5)	1 (2.5)	
Breech	2 (5)	1 (2.5)	

**Table 13: Induction of Labour**

Induction of labour	Cases No. (%)	Controls No. (%)	
Yes	20 (40)	9 (18)	0.059
No	30 (60)	41 (82)	
Total	50	50	

**Table 14: Indications for Induction of Labor**

Induction of labor	Cases No. (%)	Controls No. (%)
Preeclampsia	10 (20)	1 (2)
GDM	8 (16)	0 (0)
Past dates	2 (4)	8 (16)

**Table 15: Gestational Age at Delivery**

Gestational age (weeks)	Cases No. (%)	Controls No. (%)	
32-34.6	2 (4)	0 (0)	0.017
35-36.6	18 (36)	7 (14)	
37-40	27 (54)	35 (70)	
>40	3 (6)	8 (16)	
Total	50	50	

**Table 16: Indications for Primary Cesarean Delivery**

Indication for primary Caesarean section	Cases No. (%)	Controls, No. (%)
CPD	1 (2)	1 (2)
Failed induction	1 (2)	0 (0)
Malpresentation	4 (8)	2 (4)
Placenta previa	1 (2)	1 (2)

**Table 17: Prior Caesarean Section**

Prior caesarean section	Cases no. (%)	Controls no. (%)	
Yes	05	07 (26)	0.5383
No	45 ( )	43 (74)	
Total	50	50	

**Table 18: Distribution According to Intrapartum Complications**

Intrapartum complications	Cases No. (%)	Controls, No. (%)	P Value
Shoulder dystocia	1 (2)	1 (2)	0.951
Complete perineal tear	2 (4)	1 (2)	
Atonic PPH	1 (2)	1 (2)	
No complications	46 (92)	47 (94)	
Total	50	50	

**Table 19: Distribution According to Postpartum Complications**

Postpartum complications	Cases No. (%)	Controls No. (%)
Wound infection	8 (16)	1 (2)
DVT	2 (4)	0 (0)
Atonic PPT	2 (4)	2 (4)
Fever	4 (8)	2 (4)

**Table 20: Birth Weight of The Neonates**

Birth weight (Kgs)	Cases No. (%)	Controls No. (%)	
1.5-1.99	2 (4)	1 (2)	0.619
2-2.49	4 (8)	3 (6)	
2.5-2.99	17 (34)	18 (36)	
3-3.49	19 (38)	23 (46)	
3.5-3.49	6 (12)	4 (8)	
>4	2 (4)	1 (2)	
Total	50	50	

**Table 21: Mean Birth Weight of Neonates**

	Numbers	Mean(kg)	Standard deviation	Student t-test
Control	50	2.91	0.41	P=0.031
obese	50	3.13	0.57	

The mean birth weight of neonate was 3.13 kg in obese group and 2.91 kg in control group.

**Table 22: Apgar at 5 Minutes**

APGAR at 5 min	Cases No. (%)	Controls No. (%)	
<7	4 (8)	3 (6)	0.659
>7	46 (92)	47 (94)	
Total	50	50	

The difference of APGAR at 5 minutes between obese and control group was not statistically significant (P>0.05).

**Table 23: Indications for NICU Admissions**

NICU admissions	Cases No. (%)	Controls No. (%)
Meconium aspiration	2 (4)	1 (2)
Infant of diabetic mother	6 (12)	0 (0)
Pre term	6 (12)	4 (8)
Macrosomia	2 (4)	1 (2)
Seizers	3 (6)	1 (2)
Birth asphyxia	4 (8)	3 (6)
Hypothermia	5 (10)	1 (2)
Hypo glycaemia	8 (16)	1 (2)
Jaundice	7 (14)	7 (14)

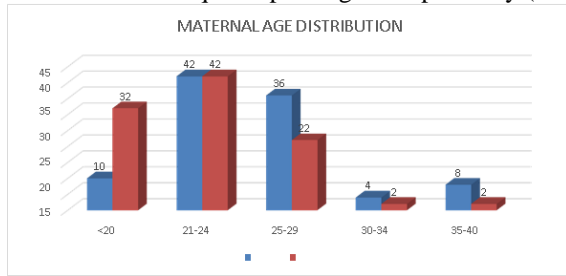
44% of babies born to obese women and 8% of babies born to control were admitted in NICU. Major indications for NICU admission among cases were infant of diabetic mother (12%) and preterm (12%) and among controls preterm (8%) and birth asphyxia (6%) were common indications.

**Table 24: Duration of Hospital Stay**

Duration of hospital stay	Cases No. (%)	Controls No. (%)	
Vaginal delivery	2	26 (52)	0.127
	>2	5 (10)	

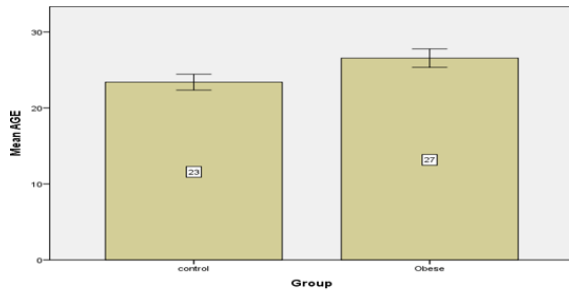
Caesarean section	7	8 (16)	10 (20)	0.008
	>7	11 (22)	1 (2)	

Among vaginal delivery group 10% of obese women and 4% of control women required prolonged hospital stay (>2 days). It was not statistically significant. Among cesarean delivery group 20% of obese women and 2% of control women required prolonged hospital stay (>7 days) which was significant.



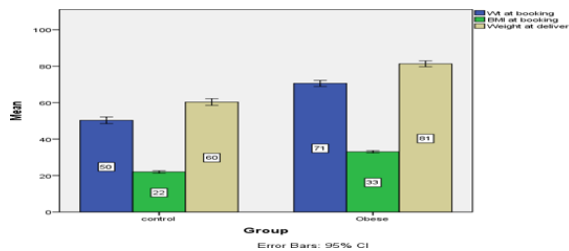
**Figure 1: Maternal Age Distribution**

Majority of pregnant women were between 21-24 years (42% each) both in cases and controls. Proportion of women in the age group >30 years were 12% in obese group and 4% in control group. This difference in age group distribution was statistically significant.



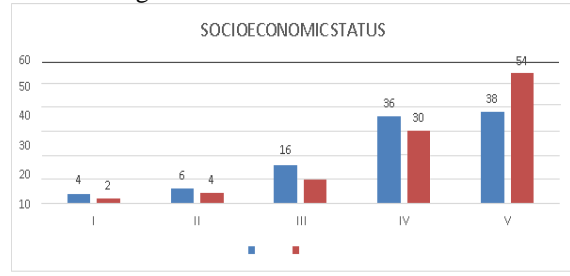
**Figure 2: Mean Maternal Age in Years**

The mean age in obese group was 26.56 years where as in control group it was 23.40 years (P=0.001). Obese women tend to be older.



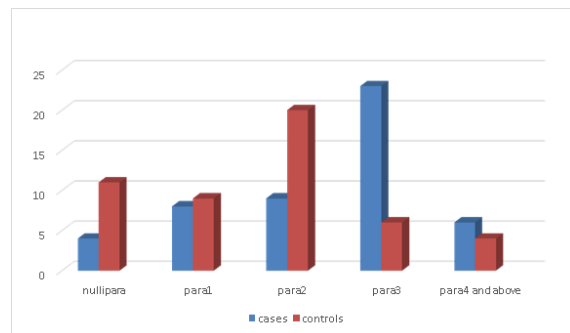
**Figure 3: Mean Maternal Weight**

The mean weight at booking in obese women was 70.56kg and in control women it was 50.32 kg. The mean BMI at booking in obese women was 33.06 kg/m<sup>2</sup> and in control women it was 22.00 kg/m<sup>2</sup>. The mean weight at term in obese women was 81.32 kg and in control women it was 60.32 kg.

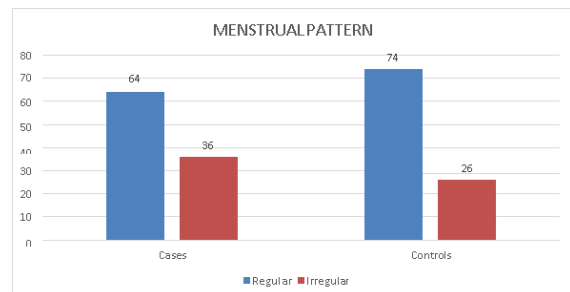


**Figure 4: Distribution According to Socioeconomic Status**

Most of the women in obese and control groups belonged to class V socio economic status.

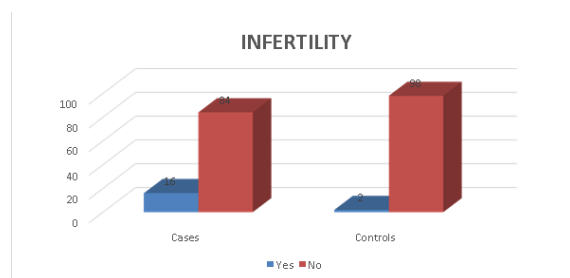


**Figure 5: Distribution According To Parity**



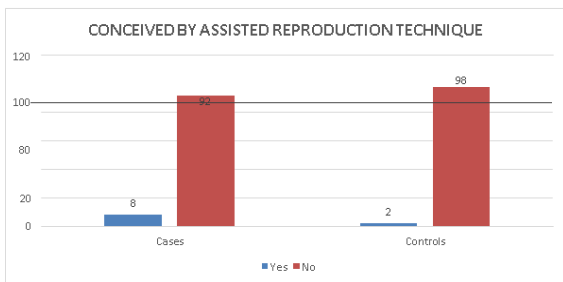
**Figure 6: Distribution According To Menstrual Pattern**

36% of obese women had irregular menstrual pattern where as 26% of control women had irregular menstrual pattern.



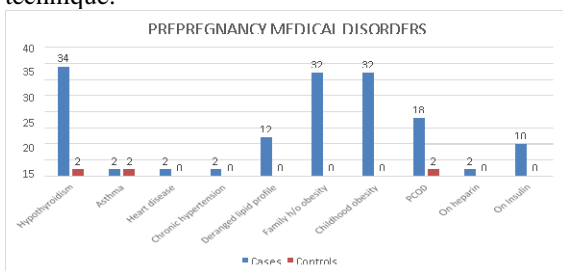
**Figure 7: Infertility**

In obese women 16% had infertility whereas in control women it was only 2%.



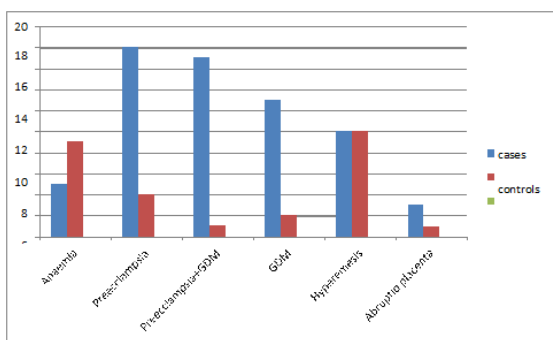
**Figure 8: Conceived By Assisted Reproduction Technique**

8% of obese women and 2% of control group women were Conceived by Assisted reproduction technique.



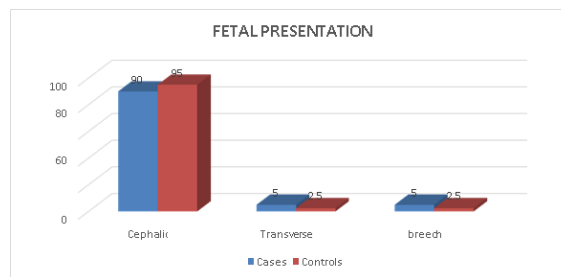
**Figure 9: Pregnancy Medical Disorders**

17 obese women (34%) were hypothyroid but in control group there was only one (2%). This difference was statistically significant. 6 obese women had deranged lipid profile, whereas none were so in control group. 9 obese women had PCOD, whereas none were so in control group. One was hypertensive in obese group, whereas none were so in control group. 16 obese women had family history of obesity and childhood obesity, whereas none in control group. One had heart disease in obese group, whereas none were so in control group. 5 cases were on insulin and 1 case was on heparin among obese pregnant women.



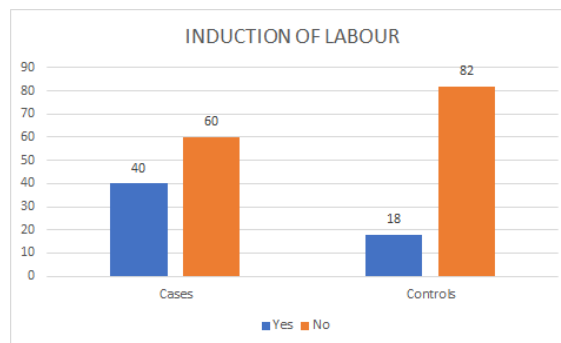
**Figure 10: Pregnancy Related Medical Disorders (Antepartum Complications)**

There was a significant raise in the incidence of GDM, pre-eclampsia and preeclampsia + GDM (26%, 36% and 34%) when compared to controls (4%, 8% and 2%). The incidence of gestational hypertension was 8.82% and 5.88% in obese and control group.



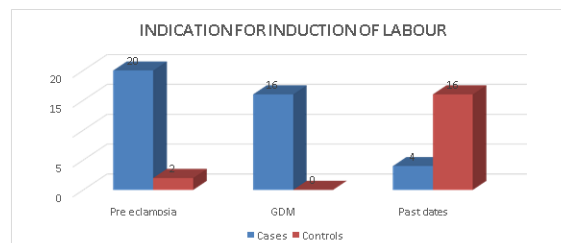
**Figure 11: Distribution According To Fetal Presentation**

90% of obese women and 95% of controls the fetal presentation was cephalic. Among cases 5% each were transverse and breech presentation. Among controls 2.5% each were transverse and breech presentation.



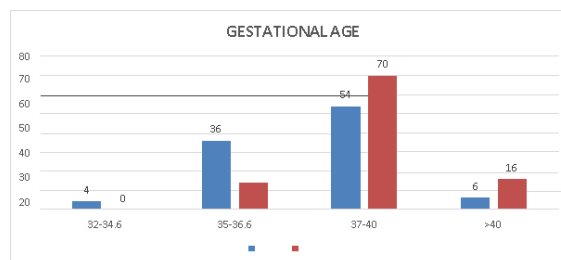
**Figure 12: Induction of Labour**

The labour induction rates were 40% and 18% in obese and control group respectively. The rates were higher in obese group and the difference was not statistically significant.



**Figure 13: Indications for Induction of Labor**

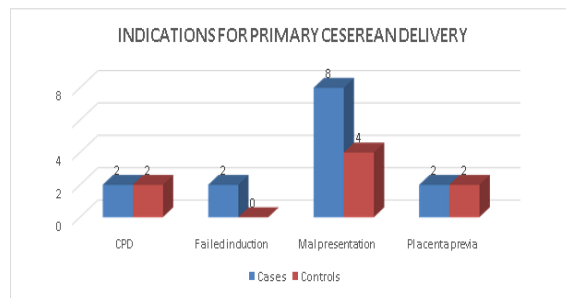
Preeclampsia was common indication for induction of labour in obese women and past dates was common indication in control group.



**Figure 14: Gestational Age at Delivery**

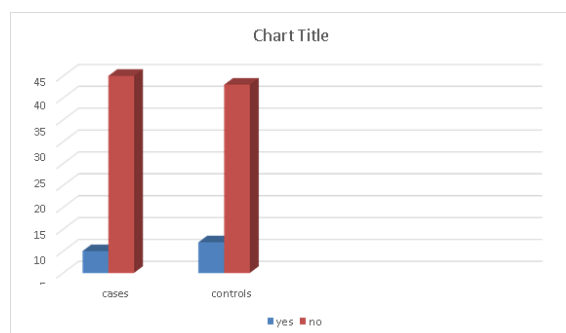


60% of obese women and 86% of control women delivered at term. 40% of obese women and 14 % of control group delivered preterm. The difference was statistically significant.



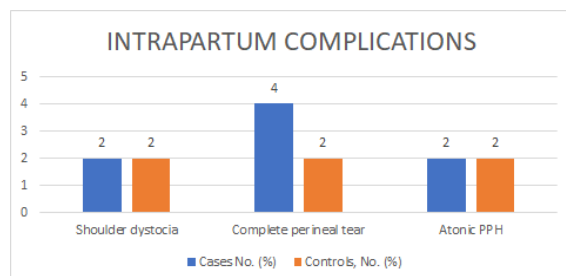
**Figure 15: Indications for Primary Cesarean Delivery**

The major reasons for primary cesarean delivery were malpresentation, CPD and placenta previa in both groups.



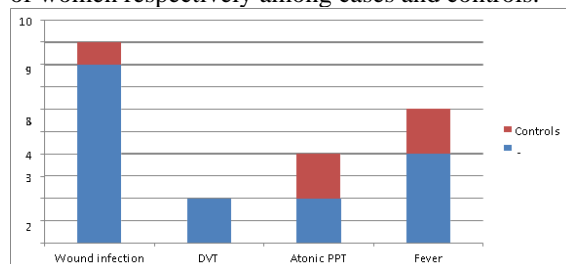
**Figure 16: Prior Caesarean Section**

10% and 14% of cases and controls had history of previous caesarean section.



**Figure 17: Distribution According to Intrapartum Complications**

Shoulder dystocia was present 2% respectively among cases and controls. 4% of obese women had complete perineal tear and 2% of controls had complete perineal tear. Atonic PPH was present 2% of women respectively among cases and controls.



**Figure 18: Distribution According to Postpartum Complications**

Wound infection, DVT and AKI rates were higher in obese group (16%, 4% and 4%) than control group (2%, 0% and 4%).

## DISCUSSION

Total 100 pregnant women were included in the study. Among them 50 women were obese and 50 women had normal BMI. In the case group 36% were moderately obese, 36% were severely obese and only 8% were morbidly obese.

Maternal age: Among both cases and controls majority of them are aged between 21-24 years, 42% each. Proportion of women > 30 years were 12% in obese group and 4% in control group. This difference in age group distribution was statistically significant. In this study the mean age in obese group was 26.56 years where as in controls it was 23.40 years (P=0.001). obese women tend to be older. In accordance to the study Alfarhli et al,<sup>[6]</sup> observed that the mean age of the study population was 30.5 years and also comparable with the study by Vanlalfeli et al 2020(88) the mean age among the obese cases was 25+\_4.44.<sup>[6]</sup>

Maternal Weight: In the current study the mean weight at booking in obese women was 70.56kg and in control women it was 50.32 kg. The mean BMI at booking in obese women was 33.06 kg/m<sup>2</sup> and in control women it was 22.00 kg/m<sup>2</sup>. The mean weight at term in obese women was 81.32 kg and in control women it was 60.32 kg.<sup>[7,8]</sup>

Socioeconomic status: In our study Most of the women in obese and control groups belonged to class V socio economic status. A significant association was observed between obesity and socioeconomic status which was in accordance with Dinsa GD et al.

Parity: In the present study, in the obese women 8% were nulliparous and 92% were parous women in accordance to the study Ehrenberg HM et al 2002 26 (90), increasing age and parity are risk factors for obesity.<sup>[9]</sup>

Pre pregnancy Medical Disorders: In the current study, 17 obese women (34%) were hypothyroid but in control group (2%). This difference was statistically significant. 6 obese women had deranged lipid profile, whereas none were found in control group, one was hypertensive in obese group, whereas none in control group. 16 obese women had family history of obesity, whereas none in control group. One had heart disease in obese group, whereas none in control group. 5 in obese women were on insulin and one in obese were on heparin.

A case-controlled study by Larsen et al showed a significant association between venous thromboembolism in pregnancy and obesity, reporting an almost ten-fold increased risk for obese pregnant women compared to non-obese.

A study from the UK Obstetric Surveillance System (UKOSS) by Knight M et al found a moderate effect, obese women were approximately two-and-a-



half times more likely to develop thromboembolism compared to lean pregnant women.

Pregnancy Related Medical Disorders (Antepartum Complications): In this study the incidence of gestational diabetes was 26% and 4% respectively in obese and control group. The incidence of pre-eclampsia was 36% and 8% in obese and control group. The incidence of both pre-eclampsia and GDM was 34% and 2% in obese and control group. The incidence of gestational hypertension was 8.82% and 5.88% in obese and control group.<sup>[10]</sup>

## CONCLUSION

Rate of maternal obesity is increasing rapidly worldwide; it is an important and individual public health issue. Maternal obesity adversely impacts pregnancy outcome, primarily through increased rates of hypertensive disease (chronic hypertension, preeclampsia, eclampsia) GDM, caesarean sections, wound infections, it is also associated with higher rates of DVT, preterm deliveries, anemia and hypothyroidism in, mother. Higher rates of NICU admissions, preterm babies were the problems in newborn. Given the current obesity epidemic and the adverse outcome, women should restore to the normal BMI well before planning pregnancy.

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