



ADVERSE EFFECTS OF OBESITY ON PREGNANCY

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ABSTRACT “A pregnancy is defined as high risk, when the probability of an adverse outcome for the mother or child is increased over the base line risk of that outcome among the general population by the presence of one or more ascertainable risk factors”. “One such pre-existing maternal morbidity that makes a pregnancy high risk is obesity”. The magnitude of the obesity prevalence has been increasing in developed and developing nations, though in varying degrees. Obesity promotes, cardiovascular disease, diabetes, hypertension, stroke etc. It becomes a major issue when it affects the women of reproductive age group, as obesity makes a pregnancy high risk, by the increased incidence of gestational diabetes, gestational hypertension, preeclampsia, labour induction, increased cesarean rates, anesthetic complications, postoperative morbidity, prolonged hospital stay etc.. They are at increased risk of macrosomia and NICU admission. So prenatal counseling plays a vital role in identifying women who are obese. Advice on weight reduction before planning for pregnancy reduce the morbidity due to obesity.

KEYWORDS : Obesity-pregnancy-complications of obesity-pregnancy and over weight

AIM OF THE STUDY

To evaluate the effects of obesity on maternal and perinatal outcome in pregnancy.

MATERIALS AND METHODS**Materials**

Antenatal mothers were chosen in their first trimester who had body Mass Index $\geq 30 \text{ kg/m}^2$ as study group and mothers with a Body Mass Index between 18.5 kg/m^2 - 24.9 kg/m^2 as control group.

Inclusion criteria

1. Pregnant women with first trimester BMI $\geq 30 \text{ kg/m}^2$.
2. Pregnant women with first trimester BMI between 18.5 kg/m^2 - 24.9 kg/m^2 .

Exclusion Criteria

1. Women with BMI between 25 kg/m^2 - 29.9 kg/m^2 .
2. Women with BMI $< 18.5 \text{ kg/m}^2$
3. Anomalous baby
4. Miscarriage
5. Mothers not booked at first Trimester

Method of Study

Pregnant mothers were selected according to the criteria and in all women detailed history followed by complete general and physical examination were done. Relevant hematological, biochemical investigations, USG were done. They were followed up to delivery and postpartum until discharge and outcome studied.

History

Relevant history such as age, parity, socioeconomic status, menstrual history, infertility, hypertension, diabetes, hypothyroidism, or other medical illnesses. History of previous pregnancy outcome was obtained in detail. Family history of obesity, hypertension and diabetes, were enquired.

Physical Examination

Detailed physical examination with regards to weight gain, pulse, BP were recorded. They were examined for anaemia, pedal edema and systemic examination of cardiovascular system, Respiratory system and Central nervous system were done.

Lab investigation

Relevant investigations were done in each case, blood sugar, Thyroid profile, Lipid profile, were done.

Follow-up of cases

With above information, the antenatal mothers were followed up during antenatal period, delivery and postpartum until discharge. They were looked for the development of the following problem.

Antenatal period

1. Gestational hypertension
2. Pre-Eclampsia
3. Gestational diabetes mellitus
4. Multiple pregnancy
5. Abruption placenta
6. Placenta Previa

Intra Partm Period

1. Labour induction
2. Mode of delivery
3. Shoulder dystopia
4. Instrumental delivery

Postpartum period

1. Postpartum hemorrhage
2. Deep vein thrombosis
3. Postoperative wound infection
4. Postoperative wound dehiscence

Duration of hospital stay**Neonates**

- Gestational age at birth
- Birth weight
- Apgar at 5 minutes, 10 minutes
- NICU admission and Indication

DATA ANALYSIS

One hundred and fifty three women with BMI $\geq 30 \text{ kg/m}^2$ and Two Hundred and fifteen women with BMI 18.5 kg/m^2 - 24.9 kg/m^2 were selected and were followed prospectively. Three obese women were excluded from the study, as two women had miscarriage one lost follow-up. 6 women with normal BMI were excluded from the study, and 4 women had miscarriage 2 lost for follow-up. The remaining 150 patient of obese and 209 with normal BMI were studied.

The data was analysed by SPSS Software (Version 17.0). The following test are used

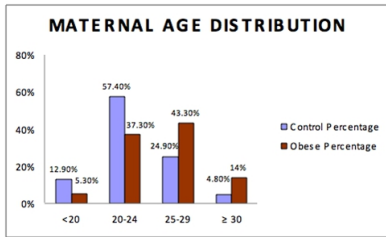
- i) Chi square test
- ii) Two sample 't' test

MATERNAL AGE DISTRIBUTION

Age (Years)	Control		Obese	
	No n=209	Percentage	No n=150	Percentage
<20	27	12.9%	8	5.3%
20-24	120	57.4%	56	37.3%
25-29	52	24.9%	65	43.3%
≥ 30	10	4.8%	21	14%

P<0.05 (significant)

The majority of obese women 43.3% were between 25-29yrs where as majority of control women 57.4% were between 20-24yrs. Proportion of women in the age group ≥ 30 yrs were 14% in obese group and only 4.8% in control group. This difference in age group distribution was statistically significant.



Mean Age

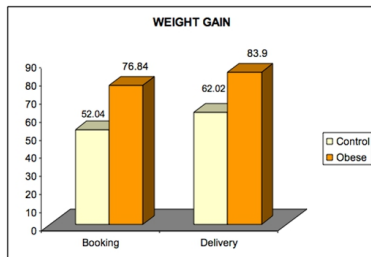
Group	Total	Mean	Standard deviation	Student t-test
Control	209	24.12	3.42	T=6.12
Obse	150	27.06	4.52	P=0.001

The mean age in obese group was 27.06 where as in control group it was 24.12 years (P=0.001). Obese women tends to be older.

MATERNAL WEIGHT

	Group	Total	Mean (kg)	Standard deviation	Student -Test
Weight at Booking	Control	209	52.04	4.686	T=32.1 P=0.001
	obese	150	76.84	9.065	
BMI at Booking	Control	201	21.82	1.70879	T=43.3 P=0.001
	obese	99	32.56	2.66237	
Weight at delivery	Control	201	62.02	5.602	T=26.6 P=0.001
	obese	99	83.9	9.056	

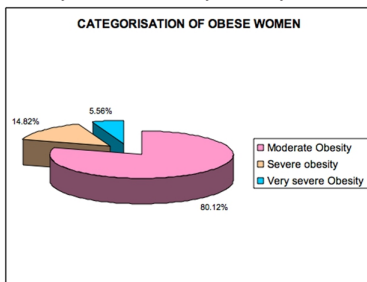
The mean weight at booking in obese women was (76.84 kg) and in control women, it was (52.04 kg). The mean BMI at booking in obese women was (32.56) kg /m² and in control women it was 21.7035 kg /m². The mean weight at term in obese women was 83.9 kg and in control women it was (62.02 kg)



CATEGORISATION OF OBESE WOMEN

BMI kg /m ²	Category	Percentage
30-34.9	Moderate Obesity	80.12%
35-39.9	Severe obesity	14.82%
≥ 40	Very severe Obesity	5.56 %

In the study group 80.12% were moderately obese, 14.82% were severely obese and only 5.56% were very severely obese.

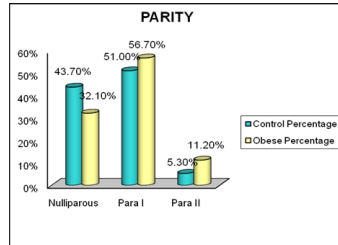


PARITY

Parity	Control		Obese	
	No N=209	Percentage	No N=150	Percentage
Nulliparous	96	43.7 %	56	32.1 %
Para I	105	51.0 %	80	56.7 %
Para II	8	5.3 %	14	11.2 %

P=0.02 (Significant)

Among obese women 32.1% were nulliparous and 67.9% were parous women, whereas in control group 43.7% were nulliparous and 56.3% were parous women



MEAN BMI IN OBESE POPULATION IN RELATION TO PARITY

Parity	Mean BMI (kg /m2)
Nulliparous	32.09
Para I	32.7
Para II	34.7

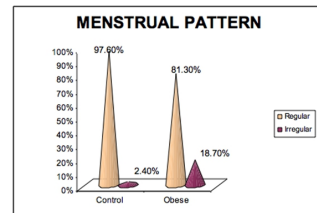
As parity increased, the mean BMI increased.

MENSTRUAL PATTERN

Menstrual	Control		Obese	
	No n=209	Percentage	No N=150	Percentage
Regular	204	97.6%	122	81.3%
Irregular	5	2.4%	28	18.7%

P=0.001 (Significant)

18.7% of obese women had irregular menstrual pattern where as 2.4% of control women had irregular menstrual pattern.

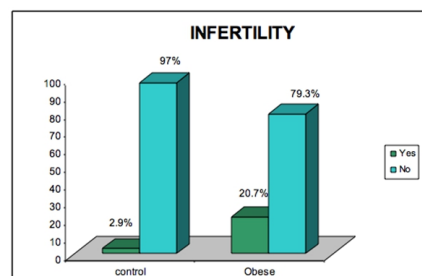


INFERTILITY

Infertility	Control		Obese	
	No N=209	Percentage	No N=150	Percentage
Yes	6	2.9%	31	20.7%
No	203	97.%	119	79.3%

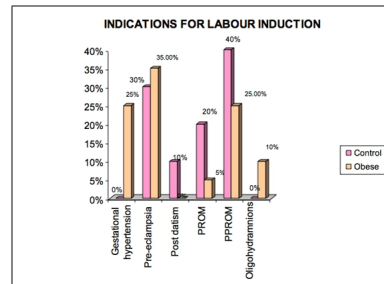
P=0.001 (Significant)

In obese women 20.7% had infertility where as in control women it was 2.9%

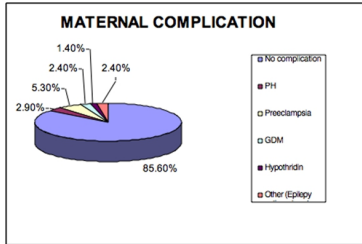


MATERNAL COMPLICATION

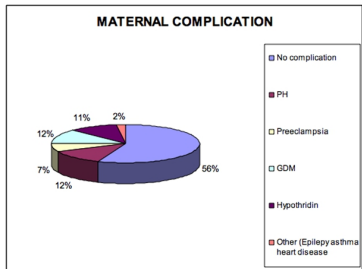
Maternal Complication	Control		Obese	
	No n=209	Percentage	No N=150	Percentage
No complication	179	85.6%	84	56.0%
PIH	6	2.9%	18	12%
Preeclampsia	11	5.3%	11	7.3%
GDM	5	2.4%	18	12%
Hypothyroidism	3	1.4%	16	10.7%
Older (Epilepsy , asthma Heart diseases)	5	2.4%	3	2%



CONTROL



OBESE

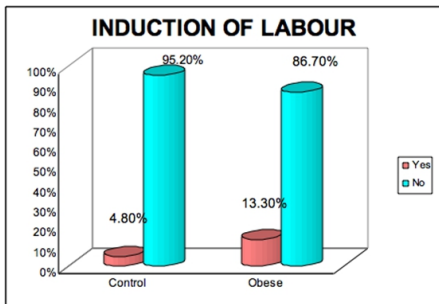


INDUCTION OF LABOUR

Induction	Control		Obese	
	No N=209	Percentage	No N=150	Percentage
Yes	10	4.8%	20	13.3%
No	199	95.2%	130	86.7%

P=0.05,

The labour induction rates were 13.3 and 4.8% in obese and control group respectively. The rates were higher in group and the difference was statistically significant. Obese women had 2.5 times increased risk of being induced than control women.



INDICATIONS FOR LABOUR INDUCTION

Induction	Control		Obese	
	No N=209	Percentage	No N=150	Percentage
Gestational hypertension	0	0%	5	25%
Pre-eclampsia	3	30%	7	35%
Post datism	1	10%	0	0%
PROM	2	20%	1	5%
PPROM	4	40%	5	25%

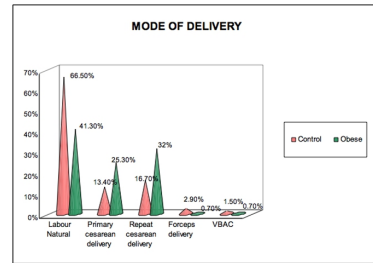
In obese group the majority of induction of labour was done for hypertensive disorders of pregnancy 60%

MODE OF DELIVERY

Mode of delivery	Control		Obese	
	No N=209	Percentage	No N=150	Percentage
Labour Natural	142	66.5%	63	41.3%
Primary cesarean delivery	26	13.4%	39	25.3%
Repeat cesarean delivery	35	16.7%	48	32%
Forceps delivery	4	2.9%	1	0.7%
VBAC	2	1.5%	1	0.7%

P=0.001, Significant

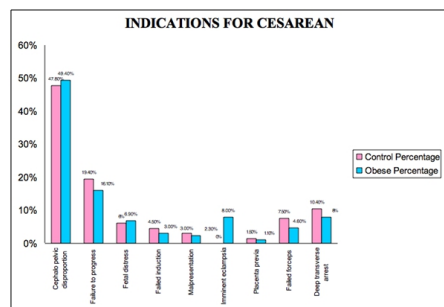
The labour natural was lower in obese group 41.3% when compared to control group 66.5%. The primary cesarean delivery rates were higher in obese group 25.3% when compared to control group 13.4%. The instrumental delivery rates and VBVC rates were 0.7% and 0.7% in obese group and 2.9% and 1-5% in control group respectively and were almost equal in both groups.



INDICATIONS FOR CESAREAN DELIVERY

Indications	Control		Obese	
	No n=67	Percentage	No N=87	Percentage
Cephalo pelvis disproportion	32	47.8%	43	49.4%
Failure to progress	13	19.4%	14	16.1%
Fetal distress	4	6.1%	6	6.9%
Failed induction	3	4.5%	3	3%
Malpresentation	2	3%	2	2.3%
Imminent eclampsia	0	0%	7	8%
Placenta previa	1	1.5%	1	1.1%
Failed forceps	5	7.5%	4	4.6%
Deep transverse arrest	7	10.4%	7	8%

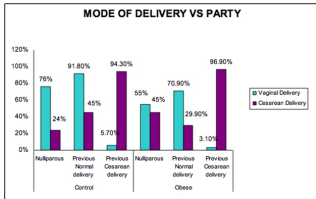
The major reasons for emergency cesarean delivery were fetal distress, cephalo pelvic disproportion and failure to progress



MODE OF DELIVERY VS PARTY

Mode of delivery	Control			Obese		
	Nulliparous (96)	Previous Normal delivery (80)	Previous Cesarean delivery (33)	Nulliparous (56)	Previous Normal delivery (45)	Previous Cesarean delivery (49)
Vaginal Delivery	76% (70)	91.8% (68)	57% (2)	55% (30)	70.9% (31)	3.1% (1)
Cesarean Delivery	24% (26)	45% (12)	94.3% (31)	45% (26)	29.9% (14)	96.9% (48)

In nulliparous women, caesarean delivery was higher in obese group 45% when compared to control group 24% (P=0.01 significant), Obese nulliparous women had 2.5 fold increased risk for caesarean delivery. Similarly in parous women with previous normal delivery, caesarean delivery was higher in obese group 29.9% than control group 8.2 (P=0.01 significant). The repeat caesarean rate was almost similar in both groups.



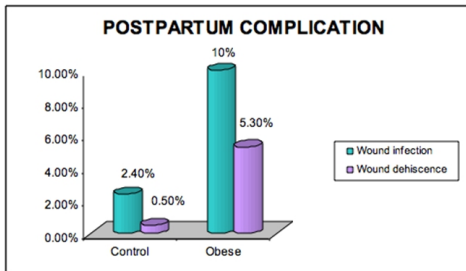
INTRAPARTUM COMPLICATION

Complication	Control	Obese
Shoulder dystocia	-	-
Complete perineal tear	-	-
Hemorrhage	1	1

No shoulder dystocia or complete perineal tear was seen in either group. There was one case of atonic hemorrhage in each group.

POSTPARTUM COMPLICATION

Complication	Control		Obese	
	No	Percentage	No	Percentage
Wound infection	5	2.4%	15	10%
Wound dehiscence	1	0.5%	8	5.3%
Deep vein thrombosis	-	-	-	-



P>0.05 Significant

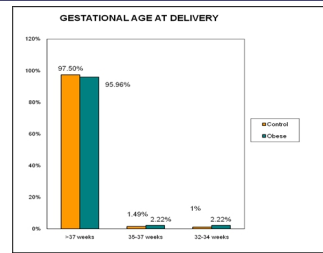
Wound infection and dehiscence rates were higher in obese group 10% and 5.3% than control group 2.4% and 0.5% respectively. Obese group had 2.47 fold and 3.12 fold increased risk for wound infection and dehiscence respectively than control group. Postpartum deep vein thrombosis was not seen in either group.

GESTATIONAL AGE AT DELIVERY

Age (weeks)	Control		Obese	
	No n=209	Percentage	No n=150	Percentage
> 37	197	97.5%	140	95.96%
35-37 weeks	7	1.49%	5	2.22%
32-34 weeks	5	1%	5	2.22%

P=0.72 Not significant

95.96% of obese women and 97.5% of control women delivered at term and 4.22% of obese women and 2.49% of control group delivered preterm. The difference was not statistically significant.

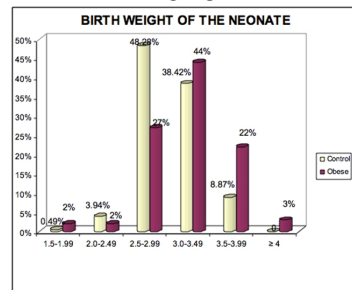


BIRTH WEIGHT OF THE NEONATE

Birth weight (kg)	Control		Obese	
	No N=209	Percentage	No N=150	Percentage
1.5-1.99	1	0.49%	3	2%
2.0-2.49	9	3.94%	3	2%
2.5-2.99	100	48.28%	37	27%
3.0-3.49	80	38.42%	71	44%
3.5-3.99	20	8.87%	32	22%
≥ 4	-	-	4	3%

P<0.05 significant

Majority of the neonates of obese women (44%) were between 3kg-3.49kg and of control women (48.28%) were between 2.5kg – 2.99kg. 22% babies of obese women were between 3.5kg -3.99kg when compared to 8.87% babies of control women 4 babies were ≥4 kg obese women but none in control group.



MEAN BIRTH WEIGHT OF THE NEONATE

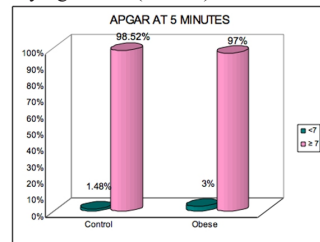
	Mean (kg)	Standard deviation	Student –t test
Control	2.8	0.323	T=4.80
Obese	3.2	0.442	P=0.001

The mean birth weight of the neonate was 3.2kg in obese group and 2.8kg in control group.

APGAR AT 5 MINUTES

Aogar at 5 Min	Control Percentage	Obese Percentage
<7	1.48%	3%
≥ 7	98.52%	97%

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

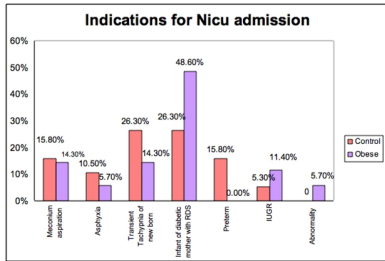


NICU ADMISSION AND THEIR INDICATIONS

Indication	Control		Obese	
	No n=19	Percentage	No n=35	Percentage
Meconium aspiration	3	15.8%	5	14.3%
Asphyxia	2	10.5%	2	5.7%
Transient Tachypnia of new born	5	26.3%	5	14.3%
Infant of diabetic mother with RDS	5	26.3%	17	48.6%

Preterm	3	15.8%	0	0%
IUGR	1	5.3%	4	11.4%
Abnormality	-	-	2	5.7%
Macroomia	-	-	-	-

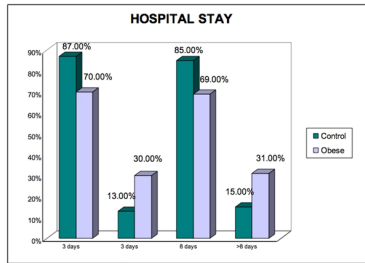
35 babies born to obese women and 19 babies of control women were admitted in NICU. (P<0.05). The major reason for admission of babies of obese women was for the care of infants of diabetic mother and in control group the reason was meconium aspiration.



HOSPITAL STAY

	Hospital stay	Control Percentage	Obese Percentage	P value
Vaginal delivery	3 days	87%	70%	<0.05
	>3 days	13%	30%	
Caesarean delivery	8 days	85%	69%	<0.05
	>8 days	15%	31%	

Among vaginal delivery group 30% of obese women and 13% of control women required prolonged hospital stay (>3 days) and in cesarean delivery group 31% of obese women and 15% of control women required prolonged hospital stay (>8 days)



DISCUSSION

In our study, the mean maternal age in obese group was 27.06 yrs. Obese women were less likely to be nulliparous. Mean BMI in obese group increased with parity. Increasing age and parity are risk factors for obesity ehrenbeing HM et al⁵¹

We observed that obese women had increased menstrual abnormalities and infertility when compared to women with normal BMI. That, obese women have menstrual abnormalities related to ovulatory dysfunction and insulin resistance leading to infertility. (Haitez Azetd & Nelson et al)⁵²

Obese woman had increased incidence of hypothyroidism (11%) in accordance with Garbaciak et al⁵³

In obese group, we found increased risk of pre-eclampsia 73%. The frequency was almost 2.3 times as high for obese group as it was for group with normal BMI.

Obese women were observed to have an increased incidence of gestational hypertension (12%) when compared with control group 2.4%. the risk of gestational hypertension among obese women was increased almost 5 fold

In our population, obese group exhibited a higher risk of developing gestational diabetes 12% when compared to normal BMI group 2.4%. There was 5.53 fold risk increase for gestational diabetes among obese women.

We observed that labour induction was more common in obese group 13.3% when compared to control group 4.8% which is in accordance with other studies. The risk of induction among the obese women was increased almost 2.5fold. cedergren et al⁵⁵, 2004 in his study had an

incidence ranging from 13.1% -18.3% according to the severity of obesity. In our study, the major reason for the induction was hypertensive disorders of pregnancy 60% in obese group.

The cesarean delivery rates were 57.3% in obese group 30.1% in control group. The primary caesarean delivery rates were higher among obese group 25.3% when compared to control group 13.4%. the caesarean delivery rates were higher among nulliparous obese group and even, obese women with previous normal delivery had higher risk for caesarean delivery. Obese nulliparous woman had 2.5 fold increased risk of caesarean delivery than lean women. We also found that, both emergency and elective primary caesarean deliveries were increased in obese group. We found no difference in repeat caesarean delivery rates between two groups.

Instrumental deliveries were not increased in obese group, which is in contrast to other studies (Joshua. L. Weiss et al⁵⁶, the increased cesarean delivery rates in obese women may explain why we did not find association between instrumental delivery and obesity. But in a large from London (Sebre NJ, et al⁵⁷), no increased tear and shoulder dystosia was not seen in either groups, which may be due to the increased cesarean delivery rates and low instrumental delivery rates.

In accordance with other studies, (Myles et al, Wolf HM et al⁵⁴) we found obese women to be at a greater risk of post – operative wound infection and women dehiscence. Obese woman had 2.47 fold and 3.12 fold increased risk for wound infection and dehiscence respectively. Atonic hemorrhage occurred in one woman in each group, and the association was not statistically significant. This may be due to the active management of third state of labour and reduced instrumental deliveries.

There was conflicting data in the literature regarding maternal obesity and preterm birth, with some studies (Baeten et al⁵⁸) showing increased risk and some studies showing no change (Sebire et al⁵⁷). In our study, no difference was found between either groups for preterm birth <37 wks. The reason for the difference in study results may reflect difference in study population.

In our study, the mean birth weight of the neonates of obese group was 3.16kg and the neonates of control groups was 2.92 kg. as previously reported, obese women had increased risk of delivering high birth weight babies. We found that 25% of obese group delivered babies 3.5 kg and above, when compared to 8.87% of control group.

Neonates of obese mother had increase NICU admission, the major reasons for admission being infants of diabetic mothers and macrosomia. There was no difference in Apgar score at 5 min between the two groups.

The obese women had prolonged hospital stay, which may be due to associated medical complication, wound infection and NICU admission

SUMMARY

In our study, 150 women (BMI>30kg/m²) and 209 women with normal BMI (18.5kg/m² – 24.99kg/m²) were studied. It was observed that:

1. Obese women were slightly older than control group. Majority of obese women belonged to age group 25-29 yrs when compared to control group, who belonged to 20-24 years age group.
2. The mean age of obese women was 27.06yrs and that of control women was 24.12yrs.
3. The proportion of nulliparous women was less in obese group (32.1%) when compared to control group(43.7%)
4. In obese group, the mean BMI increased with increase in parity.
5. Among obese group, majority (80.1%) was moderately obese, 14.82% were severely obese and 5.56% were very severely obese.
6. 18.7% of obese women had menstrual abnormalities when compared to 2.4% control women.
7. Infertility was seen in 20.7% of obese group 2.9% in control group
8. Obese women had increased incidence of gestational diabetes when compared to control group (12% Vs 2.4%). Obese group had 5.53 fold increased risk of gestational diabetes.
9. Gestational hypertension was found to be higher in obese group when compared to control group (12% Vs 2.9%). The risk of gestational hypertension among obese group was increased almost 3.6 fold.
10. Obese women were more likely to be induced (13.3%), when compared to control group (4.8%).

11. Increased cesarean delivery rates was found among obese women (57.3%) when compared to control group (30.1%). The risk increased with increase in severity of obesity.
12. Nulliparous women had 2.5 fold increased risk of cesarean delivery when compared to women with normal BMI.
13. No difference was seen among obese and control group with respect to placenta previa, abruption placenta, malpresentation, multiple pregnancy, instrumental deliveries, shoulder dystocia, complete perineal tears and hemorrhage.
14. Post operative wound infections and wound dehiscence were found to be increased in obese group (23.2%, 8.93%) when compared to control group (9.84%, 1.67%) respectively.
15. No difference was found in preterm births (<37 weeks) between two groups.
16. The majority of the neonates of obese women (44%) were between 3kg-3.4kg where as majority of neonates in control group (48%) were between 2.5kg-2.99kg.
17. No difference was seen among obese and control group with respect to Apgar score at 5 Minutes.
18. There were increased admissions to NICU among neonates of obese women (35) when compared to control group (19). The major reasons for admissions were for the care of infant of diabetic mother.
19. There was one still birth and one early neonatal death in obese group due to prematurity. None were there in control group.

Prolonged hospital stay was required in obese group (30%) when compared to control group (13%). The major reasons for the prolonged stay were due to wound infections, medical disorders and NICU admissions.

CONCLUSION

Obesity obviously increases the maternal and perinatal morbidity. To reduce these complications, pre-pregnant BMI should be within the normal limits. So health education regarding obesity should be started in adolescent clinics & pre-conceptual counseling. During pregnancy 'controlled weight gain' in obese patients is strictly advised.

i.e.

Obese Patients	-	5 to 9 kg
Over weight	-	7 to 11.5 kg
Normal weight	-	11.5 to 16 kg
Under weight	-	12.5 to 18 kg

During pregnancy obese patient are considered as high risk and their blood sugar is checked in first visit and routinely at 24-28wks. They should be carefully monitored for early detection of PIH.

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