

**Impact of Maternal Prepregnancy Overweight and Obesity on Obstetric Outcome and Neonatal Outcome**S. Lakshmi Pujitha<sup>1</sup>, R. Jyosna Devi<sup>2</sup>, Sukanya Seshasai<sup>3</sup>, Bhavani Kamanchi<sup>4</sup><sup>1</sup>Post Graduate, Department of Obstetrics and Gynecology, Government Maternity Hospital, Sri Venkateswara Medical College, Tirupathi<sup>2</sup>Assistant Professor, Department of Obstetrics and Gynecology, Government Maternity Hospital, Sri Venkateswara Medical College, Tirupathi<sup>3</sup>Professor, Department of Obstetrics and Gynecology, Government Maternity Hospital, Sri Venkateswara Medical College, Tirupathi<sup>4</sup>Assistant Professor, Department of Obstetrics and Gynecology, Government Maternity Hospital, Sri Venkateswara Medical College, Tirupathi

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**Abstract:**

**Background:** Obesity in pregnancy predisposed to various serious pregnancy complications and to higher long-term morbidity and mortality rates. Overweight and obese women have reproductive disadvantages. Obesity in pregnancy puts the mother and baby at the risk of several complications such as preeclampsia eclampsia, diabetes mellitus, preterm labour, Malpresentations, assisted vaginal delivery, instrumental delivery, elective caesarean delivery, shoulder dystocia, post-partum haemorrhage, pelvic infection and wound infection. Neonates of these mothers were mostly large for gestational age, macrosomia, congenital malformation particularly spina bifida, cleft lip and palate heart disease and still birth.

**Aim:** To study the antenatal complications, obstetric outcome and neonatal outcome in overweight and obese women and women with normal BMI.

**Material & Method:** Prospective comparative Study, done in 400 pregnant women attending Outpatient and Inpatient of Government Maternity Hospital, Tirupathi for two years period.

**Results & Conclusion:** In our study the numerous maternal and neonatal complications were observed among overweight and obese pregnant women which were a considerable challenge in obstetrics. In addition, overweight and obesity among women of reproductive age group was associated with a number of health risks factors. This shows the importance what we should give and what level of measures we should take to reduce the increasing incidence of obesity among reproductive women. The ideal time of intervention is before women become pregnancy, because it is not advised to reduce weight during pregnancy as it causes harm to both mother and baby. This shows the need of pre-pregnancy weight reduction and counseling to young reproductive women. Obese women, who became pregnant, should be aware of all risk that maternal obesity leads to during course of pregnancy and its adverse neonatal effect.

**Keywords:** Obesity, Overweight, Maternal and Fetal Complications.

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**Introduction**

Pregnancy is considered as precious moment in women life. It is a physiological normal event. However preexisting risk factors of mother or fetus and as well as conditions those develop during pregnancy and intrapartum makes it a high risk one and leading mother and neonate at risk. High risk pregnancy is defined as the one where pregnancy is complicated by a factor that adversely affect the outcome maternal or perinatal or both. Now days about 20-30% pregnancies belong to high risk. The obesity epidemic has recently emerged as one of

the greatest challenges in the provision of obstetrics and Gynecology in both developed and developing countries. Obesity is one such maternal preexisting high risk factor that complicates pregnancy during its course. National Family Health Surveys (NFHS-5) in India indicated an increase of overweight from 20.6% in (2015-2016) to 22.9 in 2019-2020 in women. [1] Obesity in pregnancy predisposed to various serious pregnancy complications and to higher long-term morbidity and mortality rates. Overweight and obese women have reproductive

disadvantages. Like infertility recurrent miscarriage and obstetrical and gynaecological complication Obesity in pregnancy puts the mother and baby at the risk of several complications such as preeclampsia eclampsia, diabetes mellitus, preterm labour, Malpresentations, assisted vaginal delivery, instrumental delivery, elective caesarean delivery, shoulder dystocia, post-partum haemorrhage, pelvic infection and wound infection. Neonates of these mothers were mostly large for gestational age, macrosomia, congenital malformation particularly spina bifida, cleft lip and palate, heart disease and still birth. Although routine weighing of pregnant women is being carried out in most of the antenatal clinics and anganwadi centre not much of importance is given to weight of the women as such. In fact, prenatal counseling plays a vital role in identifying women these at-risk women early. Advice on weight reduction before getting pregnancy will reduce the morbidity due to obesity in pregnancy and improve neonatal outcome.

**Aim:** To study the antenatal complications, obstetric outcome and neonatal outcome in overweight and obese women and women with normal BMI.

**Objective:** To study the antenatal complications, obstetric outcome and neonatal complications in overweight women with BMI 23-27.9 kg/m<sup>2</sup> and obese pregnant women with BMI >27.5 kg/m<sup>2</sup> and pregnant women with normal BMI 18.5-22.9kg/m<sup>2</sup>

#### Material and Method

**Study Area:** Government Maternity Hospital, Tirupati.

**Study Design:** Prospective comparative Study.

**Study Subjects:** Random sampling technique will be used to select study subjects among women attending obstetric outpatient department and Inpatient department at Government Maternity Hospital, Tirupati.

**Study Period:** 1 year after approval of institutional ethical Committee.

**Inclusion Criteria:** Singleton Pregnant women giving informed consent pregnant women between 18 to 40 years of age attending outpatient and inpatient department of Government Maternity Hospital, Tirupati.

**Exclusion Criteria:** Pregnant women with known medical complication like diabetics, hypertension, cardiac disease, endocrine dysfunction, multiple pregnancies.

**Sample Size:** 400

**Study Method:** This study is a prospective comparative study conducted in Government Maternity Hospital, Tirupati with pregnant women

satisfying the inclusion and exclusion criteria. Women satisfying above inclusion criteria are selected at their first antenatal visit. Study procedure is explained to the patients, written and informed consent taken. After getting consent detailed history elicited and mother will be examined in detail.

Their prepregnancy weight are recorded by recall method and documented. Women with BMI 18.5-22.9 kg/m<sup>2</sup>, BMI 23-27.5kg/m<sup>2</sup> and BMI>27.5Kg/m<sup>2</sup> selected and they divided into 3 groups. Selected women were followed on outpatient basis or communicated through phone calls. What all complications those pregnant women come across during antenatal period, during labour and after delivery are recorded. Neonates are followed after delivery and problem during neonatal period recorded.

**History:** In these women 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 was enquired. Physical Examination: Detailed physical examination with regards to weight gain, pulse, BP was recorded. They were examined for anaemia, pedal oedema and systemic examination of Cardiovascular System, Respiratory System and Central Nervous System was done.

**Lab Investigation:** Relevant investigations were done in each case. With above information, the antenatal mothers were followed up during antenatal period, delivery and postpartum until discharge. They were looked for the development of Antenatal complications: Gestational diabetes mellitus, Pre-eclampsia and Gestational hypertension, Malpresentation, Multiple pregnancy, Abruptio placenta and Placenta previa.

**Intra partum complications:** Labour induction and their indication, Mode of delivery (Vaginal/ Caesarean delivery), Shoulder dystocia, Instrumental delivery. Post-Partum Complications: Post-partum haemorrhage, Deep vein thrombosis, post-operative wound infection, Post-operative wound dehiscence, Duration of hospital stay. Neonatal Complications: Gestational age at birth, Birth weight, Apgar at 5 minutes, Admission in NICU and indications for admission were analyzed.

**Statistical Analysis:** Differences between groups were evaluated using chi- square and student t test and statistical significance was deemed at a p value of < 0.05.

#### Results

**Table 1: Analysis of Age Wise Distribution In Present Study**

Age Group (Years)	Normal (18.5 - 22.9 Kg/m <sup>2</sup> )		Overweight (23.0-27.4Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
<20 Years	24	11.1	8	7.7	10	12.5
20-24Years	86	39.8	27	26.0	13	16.3
25-29Years	83	38.4	50	48.1	28	35.0
30Years & Above	23	10.6	19	18.3	29	36.3
Total	216	100.0	104	100.0	80	100.0
Mean Age	24.60±3.75		25.70±3.42		27.15±4.64	
Chi-square	χ <sup>2</sup> =36.710 (p= 0.000) df=6 significant at 0.001 level p<0.001(Significant)					

**Table 2: Analysis of distribution of women according to socio-economic class among different BMI group: according to Revised BG Prasad socioeconomic status classification (both for urban and rural population)**

Socio economic class	BMI					
	Normal (18.5-22.9Kg/m <sup>2</sup> )		Overweight (23.0-27.4 Kg/m <sup>2</sup> )		Obese(>27.5Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
Upper	0	0	5	4.8	9	11.3
Upper middle	36	16.67	45	43.26	34	42.5
Upper lower	72	33.33	26	25	17	21.20
Lower middle	42	19.45	15	14.44	10	12.55
Lower	66	30.55	13	12.5	10	12.55
Total	216	100.0	104	100.0	80	100.0
Chi-square	df=4		χ <sup>2</sup> =26.051 (p= 0.000) significant at 0.001 level		p<0.001(Significant)	

**Table 3: Categorization of women according to height and weight:**

	Normal (18.5-22.9Kg/m <sup>2</sup> ) (n=216)	Overweight (23.0- 27.4 Kg/m <sup>2</sup> )(n=104)	Obese(>27.5Kg/m <sup>2</sup> )(n=80)	F-value (p-value)	Statistical Significance
Height	152.47± 6.205	152.86 ± 3.305	150.95± 3.884	3.438* (0.033)	P<0.05
Weight	47.41±4.430	59.16±3.969	71.34± 6.514	768.22** (0.0)	P<0.001
BMI	20.734± 1.366	25.334 ± 1.118	33.020± 2.664	1626.72** (0.000)	P<0.001

**Table 4: Analysis of distribution of women among different gravida:**

Gravida	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight (23.0- 27.4 Kg/m <sup>2</sup> )		Obese (>27.5Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
Primi	85	39.4	50	48.1	35	43.8
Gravida 2	83	38.4	46	44.2	37	46.3
Gravida 3 or more	48	22.2	8	7.7	8	10.0
Total	216	100.0	104	100.0	80	100.0
Chi-square	χ <sup>2</sup> =24.867 (p=0.008); df=4; significant at 0.001 level; p < 0.001					

**Table 5: Analysis of antenatal complications among different BMI groups:**

Antenatal Complications	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight (23.0-27.4 Kg/m <sup>2</sup> )		Obese (>27.5Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
Postdated pregnancy	15	6.9	3	2.9	17	21.3
GHTN	10	4.6	7	6.7	8	10
Non-severe Preeclampsia	5	2.3	7	6.7	10	12.5
Severe preeclampsia	0	0	0	0	10	12.5
Anemia	4	1.9	0	.0	0	.0
Malpresentation	0	.0	0	.0	4	5.0
Gestational diabetes	5	2.3	17	16.3	13	16.3

Prior LSCS	0	.0	0	.0	6	7.5
Prior LSCS with Severe preeclampsia with GDM	0	.0	0	.0	4	5.0
Prior LSCS with Severe Preeclampsia	0	.0	0	.0	4	5.0
Nil complications	177	81.9	70	67.3	4	5
<b>Total</b>	<b>216</b>	<b>100.0</b>	<b>104</b>	<b>100.0</b>	<b>80</b>	<b>100.0</b>
<b>Chi-square</b>	$\chi^2=226.50$ (p=0.000); df= 20 significant at 0.001 level; p<0.001					

**Table 6: Analysis of mode of Delivery:**

Mode of Delivery	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight (23.0-27.4Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
NVD	144	66.7	78	75.0	32	40.0
Preterm	7	3.2	1	1.0	0	.0
Instrumental delivery	0	.0	3	2.9	0	.0
<b>LSCS</b>	<b>65</b>	<b>30.1</b>	<b>22</b>	<b>21.2</b>	<b>48</b>	<b>60.0</b>
Total	216	100.0	104	100.0	80	100.0
Chi- square	$\chi^2=43.905$ (p=0.000); df=6 significant at 0.001 level; p<0.001					

**Table 7: Analysis of Indication for caesarean sections:**

Indication LSCS	BMI					
	Normal (18.5-22.9Kg/m <sup>2</sup> )		Overweight (23.0 - 27.4 Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
Failed Induction	6	9.2	5	22.7	3	6.1
Fetal Distress	8	12.3	2	9.1	5	10.2
IUGR	0	.0	0	.0	3	6.1
Meconium stained	0	.0	5	22.7	8	16.3
Oligohydromniious	14	21.5	0	.0	0	.0
Placenta previa	0	.0	1	4.5	1	2.0
Prior LSCS	24	36.9	1	4.5	16	32.7
PROM	0	.0	1	4.5	0	.0
Transverse lie	0	.0	0	.0	1	2.0
Breech	4	6.2	0	.0	3	6.1
CPD	9	13.8	5	22.7	6	12.2
Doppler Changes	0	.0	2	9.1	3	6.1
Total	65	100.0	22	100.0	49	100.0
Chi-square	$\chi^2=60.376$ (p=0.000);df= 22; significant at 0.001 level; p<0.001					

**Table 8: Analysis of Intrapartum complications among different groups**

Intra Partum complications	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight(23.0-27.4Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patient s	%
Postpartum hemorrhage	8	3.7	3	2.9	13	16.3
Shoulder dystocia	0	0	7	6.7	4	5.0
Perineal tears	0	0	6	5.8	0	0
Dysfunctional labor	0	0	7	6.7	0	0
Nil complications	208	96.3	81	77.9	63	78.8
Total	216	100.0	104	100.0	80	100
Chi-square	$\chi^2=71.671$ (p=0.000);df=8; significant at 0.001 level; p<0.001					

**Table 9: Analysis of Postpartum complications among different groups**

Postpartum Complications	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight (23.0-27.4 Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patient s	%
Nil	216	100.0	98	94.2	56	70.0
Surgical site infection	0	0	6	5.8	24	30.0
Pelvic infections	0	0	0	0	0	0
DVT	0	0	0	0	0	0
Total	216	100.0	104	100.0	80	100.0
Chi-square	$\chi^2=76.341$ (p=0.000);df=2; significantat0.001level;p<0.001					

**Table 10: Analysis of Birth weight among different groups**

Baby Weight	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight (23.0-27.4 Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
1.50- 1.99	0	.0	0	.0	8	10.0
2.00- 2.49	13	6.0	7	6.7	4	5.0
2.50- 2.99	83	38.4	33	31.7	21	26.3
3.00- 3.49	98	45.4	54	51.9	23	28.8
3.50- 3.99	22	10.2	9	8.7	16	20.0
>4.00	0	0	1	1.0	8	10.0
Total	216	100.0	104	100.0	80	100.0
Chi-square	$\chi^2=73.761$ (p=0.000);df=10; significant at 0.001 level ;p<0.001					

**Table 11: Analysis of Neonatal Intensive Care Unit (NICU) admission**

NICU	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight (23.0- 27.4Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
Yes	30	13.9	7	6.7	17	21.3
No	186	86.1	97	93.3	63	78.8
Total	216	100.0	104	100.0	80	100.0
Chi- square	$\chi^2=8.224$ (p=0.016);df=2; significantat0.05level;p<0.05					

**Table 12: Analysis of Indication for NICU admission among different groups:**

Indications for Admissions	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight (23.0-27.4 Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
IUGR	0	.0	6	5.8	4	5.4%
Jaundice	0	.0	0	.0	5	6.8%
Low birth weight	7	3.2	0	.0	0	0
Meconium aspiration	23	10.6	0	.0	0	0
Macrosomia	0	0	0	0	8	10.9%
Transient Tachypnea of newborn	0	0	0	0	6	8.2%
Anomalies	0	0	0	0	0	0
Preterm	0	.0	2	1.9	0	0
Not admitted	186	86.1	96	92.3	73	91.2%
Total	216	100.0	104	100.0	80	100.0
Chi-square	$\chi^2=86.960$ (p=0.000);df=10; significantat0.001level;p<0.001					

**Table 13: Analysis of APGAR of neonate among different group**

APGAR	BMI					
	Normal (18.5-22.9 Kg/m <sup>2</sup> )		Overweight (23.0 -27.4Kg/m <sup>2</sup> )		Obese (>27.5 Kg/m <sup>2</sup> )	
	No. of Patients	%	No. of Patients	%	No. of Patients	%
<7	19	8.8	12	11.5	5	6.3
>7	197	91.2	92	88.5	75	93.8
Total	216	100.0	104	100.0	80	100.0
Chi-square	$\chi^2=1.568$		(p=0.457);df=2		Not significant	

### Discussion

In our study, women in the overweight and obese group were slightly older when compared to women with normal BMI. The mean maternal age in obese and overweight group was 27.15±4.64 years and 25.70±3.42 years respectively. Mean age among normal BMI women was 24.60±3.75 years. Obese women were likely to be parous women. Mean BMI in obese group increased with parity. In our study among obese women primiparous 43.8% and parous women were 56.3%. Among overweight, 48.1% were primiparous and 51.9% were parous women. Among normal BMI women, 39.4% were primiparous and 60.6% were parous women. This is in accordance with the results of Ehrenberg HM et al [2] 2002, that, increasing age and parity are risk factors for obesity.

In our study, according to revised BG Prasad socioeconomic status classification both for urban and rural population, we observed that percentage of women who belonging to upper and upper middle class are obese and overweight were more. Majority of normal BMI women belongs to upper lower class with 33.33% and majority of women with overweight and obesity belongs to upper middle class with 43.26% and 42.5% respectively.

According study conducted on trends in the socioeconomic patterning of overweight and obesity in India, between 1998 and 2016, overweight/obesity prevalence, increased among men and women in both urban and rural areas. In all periods, overweight/obesity prevalence was consistently highest among higher socioeconomic class. [3] In overweight and obese group, we found increased risk of pre-eclampsia 6.7% and 25% respectively when compared to 2.3% among normal women. The frequency was almost 10 times as high for obese group as it was for group with normal BMI. [4] Overweight and obese women were observed to have an increased risk of gestational hypertension 6.7% and 10% respectively when compared with normal women 4.6%. The risk of gestational hypertension among obese women was increased almost 2 folds than women with normal BMI.

In our population, overweight and obese group exhibited a higher risk of developing gestational diabetes 16.3% each when compared to normal women 2.3%. There was 7 fold risk increase for gestational diabetes among obese women. Our

study results were consistent with several studies among obese women percentage of risk factors: Gestational diabetes was noted in 16.3% in our study and in Gladys et al 2005 [5] it was 14% and Preeclampsia was noted in 25% and in Gladys et al 2005 [5] it was 13%. Gestational Hypertension was 10% in the present study and it was 10.2% in Joshua. L. Weiss et al 2004 [6] study. We observed placental abnormalities such as placenta previa and placental abruption have equal incidence among overweight, obese women and normal weight women. Bainco et al [7] showed an increased incidence of abruption, but results of Wolf HM et al 1994 [8] including ours observation didn't show association between overweight and obesity. The caesarean delivery rates were 60% and 21.2% in obese group and overweight respectively and 30.1% among normal women. Obese women had 2 fold increased risk of caesarean delivery.

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 al, 2001 [9], Marie. I Cedergren 2004 [10]). The increased caesarean delivery rates in obese women may explain why we did not find association between instrumental delivery and obesity. But in a large study from London (Sebire NJ, et al 2001 [11]), no increased risk of instrumental delivery was seen, among obese women. Complete perineal tear were noted among overweight women with 5.8% and shoulder dystocia was seen in 6.7% and 5% among overweight and obese women.

In studies, (Myles et al 2002 [12], Wolf HM et al 1998 [13]) we found obese women to be at a greater risk of post-operative wound infection and wound dehiscence. In our study obese women had 30% surgical site wound infection and dehiscence. Atonic postpartum hemorrhage occurred 3.7%, 2.9% and 16.3% among normal, overweight and obese women respectively and the association was statistically significant. This decrease in atonic postpartum haemorrhage may be due to the active management of third stage of labour and reduced instrumental deliveries. There are conflicting data in the literature regarding maternal obesity and preterm birth, with some studies (Baeten et al 2001 [14]) showing increased risk and some studies showing no change (Sebire et al 2001 [15]). In our study, we found preterm birth risk more in normal

women with 3.2% when compared to overweight and obese 1% and 0% respectively. In our study, majority of the neonates of obese group were 3-3.5kg and we noted 10% of neonates of obese women were above 4 kg. Majority of the neonates of normal BMI group were between 3-3.5 kg and 0% above 4 kgs. As previously reported, (Ehrenberg et al 2002 [16], Sibire et al 2001 [17]) obese women had increased risk of delivering high birth weight babies. Total 44 neonates required NICU admission, among them neonates of obese, overweight and normal BMI were 21.3%, 6.7% and 13.9% respectively. The major reasons for admission being infants of diabetic mothers and macrosomia. As we observed in previous studies, the obese women had prolonged hospital stay, which may be due to associated medical complications, wound infection and NICU admission.

### Conclusion

In our study the numerous maternal and neonatal complications were observed among overweight and obese pregnant women which were a considerable challenge in obstetrics. In addition, overweight and obesity among women of reproductive age group was associated with a number of health risks factors. This shows the importance what we should give and what level of measures we should take to reduce the increasing incidence of obesity among reproductive women.

The ideal time of intervention is before women become pregnancy, because it is not advised to reduce weight during pregnancy as it cause harm to both mother and baby. This shows the need of pre-pregnancy weight reduction and counseling to young reproductive women. Obese women, who became pregnant, should be aware of all risk that maternal obesity leads to during course of pregnancy and its adverse neonatal effect. Health care professionals need to encourage and help obese women to make life style modifications and adopt health food habits, to lose pre-pregnant weight in an attempt to potentially decrease the risk of complication during pregnancy.

Obesity in pregnancy must be classified as high-risk one and proper antenatal care should be provided with great surveillance, anticipation and diagnosis of the complications and necessary intervention should be taken as early as possible if complications arise during course of pregnancy for good maternal and neonatal outcome.

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