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Indian Journal of Obstetrics and Gynecology Research

Journal homepage: www.ijogr.org

Original Research Article

A study on the effect of obesity on pregnancy outcome

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Abstract

Background: One million calories per year on an average consumed by humans and imbalance of only 1% is enough to cause an annual weight change of 1 - 2 kg. Even minor changes in intake of calories and energy expenditure may lead to weight change, if the regulation is not interacting optimally with environmental conditions. Incidence of obesity is increasing over time due to our unlimited access to food along with a sedentary life style. Obesity during pregnancy has an increased risk of preterm birth, hypertensive disorders of pregnancy, gestational diabetes mellitus, and induction of labour, cesarean section, wound infection, post-partum hemorrhage, and prolonged hospital stay. This study was done to evaluate the risks to mother and the baby when pregnancy is associated with obesity.

Materials and Methods: This is a prospective study conducted at Government medical college and hospital, between October 2019 and September 2020 for a period of 1 year after obtaining permission from the institutional ethics committee. A Total of 136 obese pregnant women attending antenatal outpatient department were taken in the study. Antenatal women who were in first trimester with body mass index (BMI) more than and equal to 30kg/m2 regardless of age and parity.

Results: In this study, 81% belonged to class I, 18% belonged to class II, and 1% belonged to class III. The incidence of gestational diabetes mellitus is 14%. The incidence of cesarean section was 75%.

Conclusion: Obesity can have a negative impact on maternal outcomes by increasing the risk of hypertension in pregnancy, preeclampsia, and gestational diabetes during the antenatal phase. The impact on neonatal outcomes can be macrosomia, increased care in the during perinatal period, increased risk of fetal mortality, impaired fetal growth and morbidity, and increased congenital abnormalities. Maternal obesity also impacts labor outcomes by causing increase in the need for induction of labor, the need for a cesarean section, and post-operative wound infections.

Keywords: Gestational diabetes, Maternal obesity, Macrosomia, Pre-eclampsia, Induction, Cesarean.

Received: 01-01-2025; **Accepted:** 03-06-2025; **Available Online**: 18-11-2025

1. Introduction

Pregnancy is seen as a physiologically normal event that is specific to each woman. The only pre-existing maternal co-morbidity that raises the risk of pregnancy is obesity. One of the biggest issues facing obstetrics practice is the rising commonness of obesity. A short time ago, obesity has become significantly more common in both industrialised and developing nations. The majority of females are corpulent or obese at the time of genesis due to the rising commonness of obesity. In India, little higher than forty percent of pregnant women were obese, with the greatest prevalence of 72% observed in the Shupiyan area of Jammu & Kashmir.[1] Obesity in females during pregnancy in the first trimester has gradually exceeding over the past 1.9 decade, rising from 7.6% to 15.6%.[2] The World Health Organisation reports that since 1975, the number of obese people worldwide has almost tripled. In 2016, over 1.9 billion humans who were eighteen years of age or older were overweight, with over 650 million of them in the obese category. In the year 2016, thirteen percentage of the adults over the age of 18 years were obese, and thirty nine

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https://doi.org/10.18231/j.ijogr.75078.1763444533

percentage were overweight.[3] In India, around 135 million people suffered from obesity.[4] Demographic changes and urbanisation, Migration from rural to urban settings, poor diets and sedentary ways of living, high level of carbohydrates in the meals, sociocultural influences, and genetic susceptibility are the primary causes of the obesity epidemic's sharp growth. Pregnancy-related obesity risk was linked to lower educational attainment and maternal age attainment, low socioeconomic status, and multiparty.[5] Except in the short term, pregnancy itself does not cause weight gain. Maternal obesity is a risk component in and of itself for a number of negative outcomes for the mother, foetus, and newborn, including miscarriage, gestational diabetes mellitus, hypertension, venous thromboembolism, increased cesarean delivery, anaesthesia difficulties and challenges, peri-operative morbidity, and in the foetus, congenital malfaormations, small for gestational age, stillbirth, injuries during parturition, shoulder dystocia, and metabolic disorders in the new born babies. A burden of the modern lifestyle, obesity has far-reaching consequences, including poor pregnancy outcomes, infertility, and an increased risk of medical conditions including diabetes and hypertension at an early age.[6]

2. Aims & Objectives of the Study

1. To assess the dangers to the mother and the unborn child when obesity is linked to pregnancy
2. To calculate the dangers to both the mother and the unborn child when obesity during pregnancy is present
3. To determine the prevalence of pregnancy-related hypertension problems and gestational diabetes mellitus in obese expectant mothers
4. To determine the frequency of cesarean sections and labour inductions
5. To learn about additional co-morbidities linked to pregnant obesity.

3. Materials and Methods

A prospective comparative study conducted at Government medical college attached to Government General Hospital, Kadapa, between October 2019 and September 2020 for a period of 1 year after obtaining permission from the institutional ethics committee. 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, and 10 had previous history of diabetes mellitus. Thirty six (36) pregnant women were excluded from the study and the final study population is 100.

3.1. Inclusion criteria

Regardless of age or parity, pregnant women in the first trimester who had a body mass index (BMI) of 30 kg/m2 or higher were eligible to take part in the study.

3.2. Exclusion criteria

1. Females with a BMI under 30 kg/m^2.
2. Pregnant ladies registered after the first trimester.
3. Diabetes mellitus in the past.
4. A history of hypertension prior to becoming pregnant.
5. Gestation of twins.

One hundred pregnant women with obesity were enrolled in the study group and compared to one hundred pregnant women of normal weight (Control Group) based on predetermined inclusion and exclusion criteria. Pregnant women were assigned based on the study group's obesity categorisation. 30 to 34.9 kg/m^2 is the class I BMI. 35 to 39.9 kg/m^2 is the class II BMI.

The nature and goal of the study were described to each participant, and their written informed consent was obtained. A structured proforma was created, given to all postgraduate students who were briefed about the current study, and asked to fill it out with the necessary information about pregnant women who were visiting the outpatient department because of pregnancy complications due to obesity. Associated haematological and biochemical and ultrasonography tests were performed on all expectant mothers. Every pregnant woman was monitored through the delivery and postpartum phases until she was released from the hospital. Studies were conducted on maternal and perinatal outcomes. Weight, height, pulse rate, temperature, blood pressure, and systemic examinations of the respiratory, cardiovascular, and central nervous systems were performed in addition to obstetric examinations.

They were checked for signs of pregnancy-related increase in the glucose levels, pre-eclampsia, and gestational hypertension. Records were kept of the following: the indication and induction of labour; the birth method (vaginal, instrumental, or cesarean section); and intrapartum problems such as shoulder dystocia, total perineal tear, and postpartum haemorrhage. Fever, wound infections, wound dehiscence, and deep vein thrombosis were among the postpartum problems that were noted. Neonatal Intensive Care Unit (NICU) admissions and their indications, birth weight, gestational age at delivery, APGAR scores (Appearance, Pulse, Grimace, Activity, and Respiration) at 1 and 5 minutes, and any congenital abnormalities were all examined.

3.3. Statistical analyses

Both study and control group data were gathered, and they were methodically imported into Microsoft Excel 2019.Statistical Package for Social Sciences version 21 was used for statistical analysis. The chi-square test was used to assess group differences, and a p-value of less than 0.05 was deemed statistically significant.

4. Results

The study comprised 100 pregnant women with a BMI of > 30 kg/m^2 as the study group and another 100 pregnant women with a BMI of 18.5–24.9 kg/m^2 as the control group. Seventy-three percent of the control group's women and fifty-eight percent (58%) of the study group's women were in the 20–25 age range. In the study group, twenty-eight (28%) of the women were between the ages of 25 and 30. Socioeconomic class V comprised 45 (45%) of the study group and 53 percent of the control group. Thirty-one (31%) and thirty-five (35%) of the study group and control group were primi-gravida. Multi-gravida status was seen in 69% of the study group and 65% of the control group.

Table 1: Classification of obesity in obese women

Obesity	Number	Percentage
Class I	81	81%
Class II	18	18%
Class III	1	1%
Total	100	100%

In this study, 81% belonged to class I, 18% belonged to class II, and 1% belonged to class III (**Table 1**).

Table 2: Incidence of gestational diabetes mellitus (GDM)

GDM	Study Group (BMI ≥30 kg/m2)		Control Group (BMI 18.5-24.9 kg/m2)	
	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 (significant)

When the incidence of Gestational Diabetes Mellitus in study and control group was studied, it was found that the incidence of GDM is 14% in the study group as compared to 2% in thecontrol group which was statistically significant with a p value of 0.008 (**Table 2**).

Table 3: Incidence of gestational hypertension

Gestational Hypertension	Study Group (BMI ≥30 kg/m2)		Control Group (BMI 18.5-24.9 kg/m2)	
	No	%	No	%
Gestational Hypertension	39	39%	11	11%
No	61	61%	89	89%

Chi Square = 20.907, p value = 0.001 (significant)

With a p value of 0.001, gestational hypertension proved statistically significant in 39 (39%) of the study group's women and 11% of the control group's women (**Table 3**).

A statistically significant p value of 0.004 demonstrates that 3% of women in the control group and 17% of women in the study group had pre-eclampsia when the frequency of pre-eclampsia was evaluated (**Table 4**).

The study and control groups' occurrences of antepartum haemorrhage were contrasted and the results demonstrated that they were equivalent.

The study group suffered a 19% incidence of preterm labour, whereas the control group witnessed a 7% incidence.

Table 4: Incidence of pre-eclampsia

Pre-Eclampsia	Study group (BMI ≥30 kg/m^2)		Control Group (BMI 18.5-24.9 kg/m^2)	
	No	%	No	%
Mild pre-eclampsia	9	9%	2	2%
Severe pre-eclampsia	8	8%	1	1%
No pre-eclampsia	83	83%	97	97%

Ninety five percentage in the study group and ninety eight percentage in the control group showed vertex presentation when the prenatal presentation was checked out. A single percent of the control group and five percent of the study group exhibited breech. Transverse lies occurred in 1% of the control group and 0% of the study group, yet these weren't statistically significant (chi square = 3.713, p value = 0.156 (non-significant).

With a statistically important p value of 0.034, 26 (26%) of the study group's women and 14% of the control group required in order to have their deliveries accelerated.

Table 5: Mode of delivery

Mode of Delivery	Study Group (BMI ≥30 kg/m2)		Control Group (BMI 18.5-24.9 kg/m2)	
	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 (significant)

The occurence of cesarean section was seventy five in the study group and twenty percent in control group. Twenty three (23%) in the study set and seventy nine percent in the control set had normal vaginal delivery. Two percentage in the study group and one percentage in the control group had instrument assisted delivery with a statistically significant p value of 0.001 (**Table 5**).

Twenty percent (20%) in the study set had cephalo pelvic disproportion. The typical indication of primary cesarean section was cephalo pelvic disproportion in study set (**Table 6**).

In this study, when the birth weight and its association with maternal obesity was done, it showed fifty eight percent of the new borns in the study set and 49% of the babies in the control group belonged to birth weight 3-3.9 Kg. The incidence of macrosomia was 4% in the study group and 0% in the control group. No significant association was seen (p value =0.08) (**Figure 1**).

Table 6: Indication of primary cesarean section was CPD in the study group

Indications of C-section	Study Group (BMI ≥30 kg/m²)		Control Group (BMI 18.5-24.9 kg/m²)	
	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

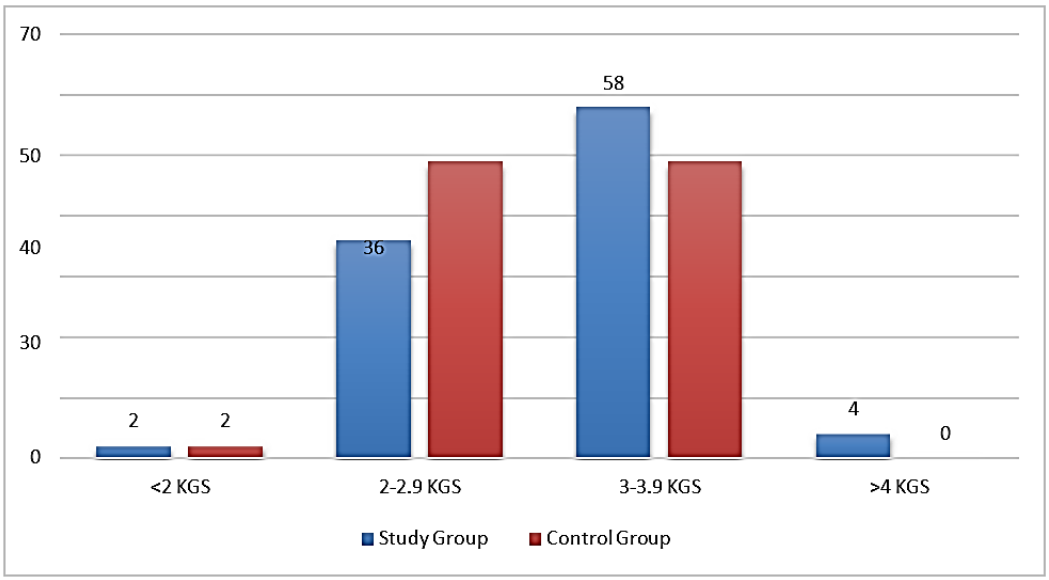

Figure 1: Birth weight of the babies in study and control groups

When the NICU admissions were accounted, only eight percent (8%) new borns in the study set and two percent (2%) new borns in the control group needed neaonatal intensive care unit admissions.

In this study when wound infection, wound dehiscence, deep vein thrombosis and post-partum hemorrhage was studied; the occurence of wound infections in the study group was eleven percent (11%) as compared to zero percent (0%) in the control set with a statistically significant p value of 0.001.

When the duration of hospitilization in the study and control sets was done, among the normal vaginal deliveries, average duration of the hospitilzation was 2.65 days in the study set and 7.15 days in the control set.

Table 7: Fetal outcome

Fetal Outcome	Study Group (BMI ≥30 kg/m²)		Control Group (BMI 18.5-24.9 kg/m²)	
	No.	%	No.	%
Live Birth	100	100%	99	99%
IUD	0	0%	1	1%

The occurence of live birth is hundred percent (100%) in the study group & ninety nine percent (99%) in the control set (**Table 7**).

5. Discussion

One of the largest health issues facing the world today is the obesity pandemic, which directly affects women in their reproductive years. Sedentary lifestyles, smoking, and late-age percentage of pregnancies is rising in the current generation, which has a adverse effect on the results of

pregnancy. The process of becoming pregnant and giving birth is made more difficult by obesity.

The current study strengthens the body of evidence showing that obesity during pregnancy is linked to adverse health outcomes for both the mother and the foetus, including a higher risk of preeclampsia, gestational diabetes mellitus, gestational hypertension, induction of labour, cesarean section, wound infections, and longer hospital stays. Of the women in this study, 58% were between the ages of 20 and 25, and 28% were between the ages of 25 and 30. Thirteen percent (13%) of the ladies were in the over-30 age range. One percent were under the age of twenty. This demonstrated that the prevalence of obesity rises with age. The majority of obese women in a Vanlalfeli et al. study were between the ages of 20 and 25.[7] A research by Vernini et al. found that pregnant women aged 35 and up were more likely to be overweight or obese.[8] According to a study by Sinha K et al., 40% of obese women are between the ages of 20 and 25.[9]

Eighty-one percent of women were classified as obese in class I, eighteen percent in class II, and one percent in class III. The bulk of the obese women in my study fell into class I (BMI: 30-34.9 kg/m^2).

The Prameela H.J et al. study found that 10.7% of women had class III obesity, 23.2% had class II obesity, and 66.07% had class I obesity.[10] Of the obese women in this study, 31% were primigravida, 69% were multigravida, and 6% were grand multigravida. In line with the findings of Inigomelchor et al., who discovered that 51.98% of the study group were multigravida and 48.02% were primigravida, this demonstrated that multigravida are more obese than primigravida.[8] The findings of this study supported the findings of the Ehrenberg H M et al study, which found that age increases the risk factors for obesity, and the Sinha K et al. study, which found that multigravida are more fat than primigravida.[9,11] This study found that 14% of pregnant women had gestational diabetes mellitus, with a significant p-value of 0.008. This demonstrated that obese women had a higher chance of getting gestational diabetes mellitus.

This incidence is compared with other studies and tabulated in **Table 8**.

Table 8: Comparison of gestational diabetes mellitus incidence

S. No.	Study	Percentage
1	Vernini et al[12]	39.4
2	Imran kutchi et al[13]	35
3	Shin Y Kim et al[14]	30.8
4	Ramalakshmi S et al[15]	15
5	Vanlalfeli et al[7]	10.39
6	Prameela H J et al[10]	5.3
7	Inigo Melchor et al[8]	5.02
8	Present study	14

In this study, incidence of gestational hypertension was 39% which is litter higher than the studies done by Vanlalfeli et al, where the incidence of gestational hypertension was 20.78% and in Imran Kutchi et al study, incidence of gestational hypertension was 11.76%.[7,13]

Obesity is a risk factor for developing hypertensive disorders of pregnancy, as evidenced by the study's 17% pre-eclampsia incidence among obese women. The incidence of pre-ecalmpsia was 16.67% in the study by Khan Kutchi et al. and 42.8% in the study by Prameela H J et al.[10,13]

The incidence of abruption in this investigation is zero percent. In the obese group, the incidence of placenta previa is 1%, but it is not statistically significant. A research by Inigomelchor et al. found that the incidence of antepartum haemorrhage was 0.63%.[8] A study by Salihu et al. found that antepartum haemorrhage is less likely to occur in obese people (1%).[16] In comparison to non-obese women, obese women with placenta previa were more likely to have higher maternal morbidity, according to a research by Arditi et al.[17]

Preterm labour and PPROM incidences are 19% and 2%, respectively, which is somewhat higher than the findings of the Hendler et al. study,[18] in the study group, induction of labour occurs 26% of the time. The incidence of induction of labour was 38.69% in the study by Inigomelchor et al.[8] Kutchi et al. found that the incidence of induction of labour was 62.5%, but Vanlalfeli et al. found that the rate was 31.17%.[7,13]

The results of the Arrow Smith et al. study (48.6%) and the majority of other studies that demonstrated that obese women had higher rates of induction of labour are in agreement with the findings of this investigation.[19]

This study's 75% cesarean section incidence is in line with Vernini et al.'s study, which found a 72.4% rate.[12] According to my research, 58% of newborns were born weighing between 3 and 3.9 kg.

According to this study, the average length of hospital stay for vaginal birth was 2.65 days, while the average for cesarean delivery was 7.95 days.

Hood et al. and Ellis JA et al. demonstrated that obese women require longer hospital stays.[20,21]

Macrosomia was observed in just 4% of cases. Hood et al. reported that 26% of people had macrosomia.[20]

Pregnant women who are obese and their unborn children are at risk for major pregnancy-related issues such as gestational diabetes mellitus, pre-eclampsia, gestational hypertension, higher rates of induction of labour, longer hospital stays and NICU admissions, and more. Obesity's detrimental effects on health are astounding. Later-life risks include those for osteoarthritis, diabetes mellitus, heart disease, high blood pressure, and stroke. Although Vanlalfeli

et al. reported a NICU admission rate of 38.96%, the frequency of NICU admission rates in this study was 8%.[7]

All healthcare professionals need to be made aware of the harmful impacts of obesity. In order to manage pregnancy-related obesity and lower the risks and issues that come with it, obese women should be educated about lifestyle changes and physical exercise. Because it is a controllable risk factor, pregnancy-related obesity can be avoided. The economic and health effects of increased obesity rates are more significant from a public health perspective for those in the childbearing age range.

6. Conclusion

Obesity or gestational obesity is a controllable risk factor which can be modified by healthy life style. The optimum time to raise awareness of the problems associated with obesity during pregnancy is during preconceptional counselling; consequently, dietary interventional interventions should be initiated at this time. Women in the reproductive age range should be aware of the value of maintaining a healthy weight prior to becoming pregnant. Effective anti-obesity measures should be put in place both domestically and internationally to halt this expanding health issue.

7. Limitations of the Study

1. Large sample size studies are required to analyse more in-depth association between obesity in pregnancy and its associated complications.
2. Some confounding factors like diet, physical activity and genetics were notconsidered in this study.

8. Source of Funding

None.

9. Conflict of Interest

None.

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Cite this article: Sakuntala DS, Narayanamma L, Akshitha D, Jaggina L. A study on the effect of obesity on pregnancy outcome. *Indian J Obstet Gynecol Res*. 2025;12(4):631–637.