

# A Comparative Study of the Effect of Body Mass Index on Pregnancy Outcomes in Normal and Overweight Women

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## Abstract

### Background:

Maternal obesity is associated with various antepartum, intrapartum, postpartum, and neonatal complications. Increasing rates of overweight among pregnant women become a significant public health concern with various implications for prenatal care and supervision of delivery.

### Objective:

The study aimed to determine the adverse maternal and fetal outcomes in primigravid overweight and obese women delivering singleton babies.

### Methods:

A prospective comparative study was conducted for one year at the Department of Obstetrics and Gynecology, Combined Military Hospital, Rangpur, during the period between July 2019 to June 2020. Primigravid women with a singleton uncomplicated pregnancy with a cephalic presentation at  $\geq 37$  weeks of gestation with accurate information regarding height and weight recorded at the booking visit were included in the study. Comparisons were made between 50 primigravidas with BMI  $\geq 25$  and 50 uncomplicated primigravidas with BMI between 18.5 - 24.99. Statistical analysis was done using SPSS version 16.0. Data were analyzed by the Pearson Chi-square test and Fisher's exact test.

### Results:

There was a significant increase in risk of developing gestational hypertension (RR=3.667; CI=1.63-8.27), preeclampsia (RR=7; CI=0.89-54.83), gestational diabetes (RR=7; CI=0.89-54.83), failed induction of labour (RR=5.50; CI=1.28-23.55), failure to progress (R=6, CI=1.41-25.44), macrosomia (RR=8, CI=1.04-61.62), NICU admissions (RR=2.45; CI=1.37-4.39), perineal lacerations (RR=7; CI=0.89-54.83), wound infection (RR=8; CI=1.04-61.62) among overweight mothers compared to non-obese mothers.

### Conclusions:

It is concluded that obesity defined by Asian Indian guidelines (BMI  $\geq 25$  kg/m<sup>2</sup>) is associated with adverse maternal and fetal outcomes.

**Keywords:** Overweight, Obesity, Pregnancy outcome, Perinatal outcome.

## Introduction:

Obesity is a growing health problem worldwide. World Health Organization (WHO) is defined obesity as abnormal or excessive fat accumulation that may impair health with a body mass index (BMI) of 30 kg/m<sup>2</sup> or more and obesity is defined by Asian Indian guidelines as BMI  $\geq 25$  kg/m<sup>2</sup>,<sup>1</sup> the American Medical Association classified obesity as a disease. The prevalence of obesity among women of reproductive age is increasing worldwide, with current estimates of 20-36%.<sup>2</sup> The latest

reports of the World Health Organization (WHO) indicate that in 2005, approximately 1.6 billion adults were overweight and at least 400 million adults were obese - a major contributor to the global burden of chronic disease and disability.<sup>3</sup> As the prevalence increases among the women of the reproductive age group, so does among pregnant females. Maternal overweight has been reported as a risk factor for various antepartum, intrapartum, postpartum, and neonatal complications such as gestational diabetes mellitus, gesta-

tional hypertension, antepartum hemorrhage, induction of labour, prolonged duration of labour, increased cesarean section rates, postpartum haemorrhage, shoulder dystocia, macrosomia, and neonatal admissions.<sup>4,5</sup> Increasing rates of overweight among pregnant women have become a significant public health concern with various implications for prenatal care and supervision of delivery. The aim of the study was to compare the incidence of complications in the antepartum, intrapartum, and postpartum period and the perinatal outcome in patients with overweight and obesity with that of patients with normal body mass index.

**Methods:**

We conducted a prospective comparative study for one year at the Department of Obstetrics and Gynecology, Combined Military Hospital Rangpur, during the period between July 2019 and June 2020 after ethical committee approval. All primigravidas with singleton pregnancies admitted at ≥ 37 weeks of gestation with accurate weight and height recorded at 1st booking visit were included and were categorized into two groups. 50 primigravidas with BMI ≥25 were selected as the study group and the control group was 50 uncomplicated primigravidas with BMI between 18.5-24.99. All multigravida, primigravida with multiple

pregnancies and malpresentation, and primigravidas with a history of medical illness who were underweight and who do not have accurate weight and height recordings in the 1st trimester were excluded from the study. Detailed written informed consent was obtained from the participants before they were included in the study. A detailed history of the patients was taken and a systemic examination was done. Outcomes assessed included gestational hypertension, gestational diabetes, induction of labour, prolonged labour, cesarean section rates, postpartum hemorrhage, wound infection, macrosomia, and neonatal admissions in both the groups and results analyzed. Statistical analysis was done using SPSS version 26.0. Data were analyzed by Pearson Chi-Square test and Fisher’s exact t-test. A p-value <0.05 was significant. Relative risk (RR) and Confidence Interval (CI) were used to quantify the risk.

**Results:**

A total of 100 patients, 50 primigravidas with BMI ≥25 and 50 primigravidas with BMI between 18.5 - 24.99 were included in the study. There were no differences in the age distribution of both groups. Fetomaternal complications like hypertensive disorders and diabetes mellitus were the two most common antenatal complications encountered in the study group.(Tables-I and II)

**Table-I: Antenatal complications-hypertensive disorders**

Antenatal complication	Study incidence (n=50)	Control incidence (n=50)	Relative risk [RR]	95% Confidence Interval [CI]	p-value
Gestational hypertension	22(44%)	6(12%)	3.667	1.63-8.27	0.0003
Preeclampsia	7(14%)	1(2%)	7.000	0.89-54.83	0.0269

**Table-II: Antenatal complications-diabetes mellitus**

Antenatal complication	Study incidence (n=50)	Control incidence (n=50)	Relative risk [RR]	95% Confidence Interval [CI]	p-value
Impaired glucose tolerance	8(16%)	1(2%)	8.00	1.03-61.62	0.0144
Gestational diabetes	7(14%)	1(2%)	7.00	0.89-54.83	0.0269
Pre-gestational diabetes	6(12%)	0(0%)	-	-	0.0115

62% of mothers in the study had cesarean section when compared to only 5% in the control group. The three most common statistically significant

indications for cesarean section were failed induction, failure to progress, and a prolonged period of infertility in the study group.(Table-III)

**Table-III: Indications for cesarean section**

Indication for Cesarean section	Study incidence (n=50)	Control incidence (n=50)	Relative risk [RR]	95% Confidence Interval [CI]	p-value
Failed Induction	11(22%)	2(4%)	5.50	1.28-23.55	0.0074
Failure to progress	12(24%)	2(4%)	6.00	1.41-25.44	0.0039
Prolonged period of Infertility	8(16%)	1(2.0%)	4.00	0.89-17.91	0.0445

Macrosomia and NICU admissions were also found to be statistically significant in the study group (Table-IV).

The three statistically significant postpartum complications in the study group were wound infection, perineal lacerations, and postpartum hemorrhage (Table-V).

**Table-IV: Macrosomia and NICU admission**

Parameter	Study incidence (n=50)	Control incidence (n=50)	Relative risk [RR]	95% Confidence Interval [CI]	p-value
Param Birth weight >4kg	8(16%)	1(2%)	8.00	1.04-61.62	0.0144
NICU admission	27(56%)	11(22%)	2.45	1.37-4.39	0.0009

**Table-V: Postpartum complications**

Postpartum complications	Study incidence (n=50)	Control incidence (n=50)	Relative Risk [RR]	95% Confidence Interval [CI]	p-value
Wound infection	8(16%)	1(2%)	8.00	1.04-61.62	0.0144
Perineal laceration	7(14%)	1(2%)	7.00	0.89-54.83	0.0269
Postpartum hemorrhage	4(8%)	0(0%)	-	-	0.0412

**Discussion:**

In the present era, lifestyle-related factors like sedentary lifestyle, high-calorie food consumption, and late age pregnancies, adversely affect the pregnancy outcome. The average BMI is increasing among all age categories and women are entering pregnancy at higher body weights.<sup>5</sup> It is now universally acknowledged that maternal overweight and obesity are linked with adverse pregnancy outcomes. Maternal complications include hypertension, diabetes, and more frequent cesarean delivery with increased postpartum hemorrhage, and wound infection. Newborn complications include congenital malformations, large infants, stillbirths, shoulder dystocia, and long-term adolescent complications (obesity and diabetes). With proper antenatal and intranatal care, good outcomes can be achieved in

overweight and obese women.<sup>4,5</sup> This study added to the evidence that obesity during pregnancy, in spite of adequate antenatal and prenatal care, leads to increased interventions, medical as well as obstetric, and do pose a risk to mother and fetus. In a previous retrospective, case-control study conducted by Sara Sukalich et al<sup>6</sup> gestational hypertension and preeclampsia were statistically higher (p-value <0.05) in the study group with an odds ratio of 1.8, 95% CI (1.4-2.3) for gestational hypertension and with an odds ratio of 1.7, 95% CI (1.2- 2.4) for preeclampsia. In a retrospective cohort study conducted by Sebire et al<sup>7</sup> and a study conducted to assess the prevalence of overweight and obesity in an Australian obstetric population, conducted by Callaway et al,<sup>8</sup> observed gestational diabetes was significantly higher in their study population with a p-value

<0.05, with an odds ratio 1.68, 95% CI (1.53-1.84) and odds ratio 1.78, 95% CI (1.25-2.52) respectively in each of the studies. In a study conducted by Sebire et al<sup>7</sup> showed induction of labour was significantly higher in the study group with a p-value <0.05 with an odds ratio of 2.14, 95% CI (1.86-2.04). In a study conducted by Usha Kiran et al,<sup>9</sup> the mean duration of labour was 8.09 hours in the study group with BMI >30 and 7.7 hours in the control group with BMI 20-30.7 The Cesarean section rates were significantly higher in obese mothers in the studies conducted by Usha Kiran et al<sup>9</sup> and Owens LA et al<sup>10</sup> with an odds ratio of 1.6 and 1.57 respectively and 95% CI 1.4-2 and 1.24-1.98 respectively. In a study conducted by Usha Kiran et al,<sup>9</sup> macrosomia and NICU admissions were statistically significant with an odds ratio of 2.1, 95% CI 1.6-2.6 for macrosomia, and odds ratio of 1.5, 95% CI 1.09-2.3 for NICU admission respectively.<sup>9</sup> Postpartum complications like postpartum hemorrhage were significantly higher in the obese mothers in the study conducted by Usha Kiran et al<sup>9</sup> and wound infection in the study conducted by Yu et al with an odds ratio of 1.5 and 95% CI 1.2-1.8 for postpartum hemorrhage and odds ratio 1.27, 95% CI 1.09-1.48 for wound infection respectively.<sup>11</sup> Prolonged hospital stay was also significantly high in a study conducted by Perlow JH et al with a p-value of 0.0003.<sup>11</sup>

### Conclusion:

The developing world is being seized by the epidemic, of obesity. In Bangladesh, the burden of being overweight also increased significantly in recent years. These rates are particularly alarming among women of childbearing age. Obesity in pregnancy is associated with an increased rate of antepartum, intrapartum, and postpartum complications in the mother and adverse outcomes in the neonate as well. Maternal obesity when defined as pregnancy BMI  $\geq 25$  kg/m<sup>2</sup> for our population, there is an increased risk of maternal and perinatal complications and comprehensive strategies need to be developed to improve maternal and perinatal outcomes in obese mothers.

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