

Original Research Article

# ASSOCIATION OF PRE-PREGNANCY BODY MASS INDEX TO GESTATIONAL WEIGHT GAIN, DIABETES MELLITUS AND HYPERTENSION: A TEACHING HOSPITAL BASED STUDY

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Received : 05/04/2024  
Received in revised form : 15/05/2024  
Accepted : 25/05/2024

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DOI: 10.5530/ijmedph.2024.2.171

Source of Support: Nil.  
Conflict of Interest: None declared

Int J Med Pub Health  
2024; 14 (2); 885-888

## ABSTRACT

**Background:** Pregnancy outcomes may be correlated with both gestational weight gain (GWG) and body mass index (BMI) prior to conception. Macrosomia, gestational diabetes, and preeclampsia all exhibit a correlation with BMI.

**Material and Methods:** The study screened 786 patients who reported to the department. 145 patients were excluded due to missing data. And 75 were excluded as the inclusion criteria was not satisfied. Finally, 566 pregnant women were studied.

**Results:** 02(2.38%) of the recommended weight gain group developed GDM. 04(4.76%) of Women with less than recommended weight gain also developed GDM. 46(54.76%) women in more than recommended weight gain had GDM which was statistically significant ( $p < 0.01$ ). Gestational hypertension was significantly more in mothers with greater than recommended weight gain (25.0%;  $p = 0.004$ ).

**Conclusion:** Pregnancy-related nutrition counseling, exercise, and lifestyle changes can reduce the risk of gestational diabetes mellitus and gestational hypertension.

**Keywords:** Preeclampsia, Gestational diabetes mellitus, Gestational weight gain & Body mass index.

## INTRODUCTION

Pregnancy outcomes may be correlated with both gestational weight gain (GWG) and body mass index (BMI) prior to conception.<sup>[1]</sup> There is a correlation between BMI and preeclampsia, gestational diabetes, and macrosomia. Preterm births and small-for-gestational-age (SGA) newborns are more common in moms with low body mass index (BMI).<sup>[3]</sup> Low GWG is probably beneficial for obese women. GWG and BMI are strongly correlated with genetics, lifestyle, and other health issues.<sup>[4]</sup> Physiologic weight gain in pregnancy is contributed to by the foetus (3.2-3.6 kg), fat deposition (2.7-3.6 kg), increased blood volume (1.4-1.8 kg), increased extravascular fluid volume (0.9-1.4 kg), amniotic fluid volume (0.9 kg), breast enlargement (0.45-1.4 kg), uterine hypertrophy (0.9kg), and placenta

(0.7kg).<sup>[5]</sup> Obesity is one of the most serious global health concern according to the World Health Organization (WHO).<sup>[6]</sup> Based on the BMI, obesity is graded as Class I (30.0–34.9); class II (35.0–39.9), and class III or morbid obesity (BMI 40).<sup>[7]</sup> At the first prenatal visit, obesity in pregnancy is assessed if the BMI is 30 kg/m<sup>2</sup>.<sup>[12]</sup> In addition, the suggested weight growth was determined using established factors depending on weight categories.<sup>[13]</sup> Pregnancy-related obesity increases the risk of immunological, metabolic, and neurodevelopmental disorders.<sup>[14]</sup> Compared to women with a normal BMI, mothers who are obese also undergo more cesarean sections and are less likely to breastfeed.<sup>[15]</sup> Additionally, moms who are fat have a higher chance of dying as mothers.<sup>[16]</sup> Gestational diabetes mellitus is defined as glucose intolerance that manifests itself during pregnancy for the first time (GDM).<sup>[17]</sup> Type 2 diabetes

mellitus development later on and prenatal problems are known to be associated with GDM.<sup>[18]</sup> Pregnancy-related weight increase, which typically occurs in the second trimester, can lead to insulin resistance and fat deposition.<sup>[19]</sup> If weight increases quickly or disproportionately, insulin resistance increases.<sup>[20]</sup> The purpose of this study was to investigate how pre-pregnancy BMI interacted with other risk factors.

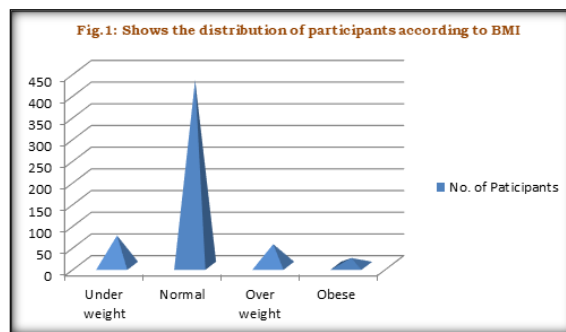
## MATERIAL AND METHODS

This present retrospective analysis study was conducted in the department of Obstetrics and Gynecology Department of the Venkateshwara Institute of Medical Sciences in Gajraula, Uttar Pradesh during the period from December, 2022 to December, 2023. 786 patients who came to the department were screened for the study. Insufficient data led to the exclusion of 145 patients. And because the inclusion condition wasn't met, 75 people were eliminated. In the end, 566 expectant mothers were examined.

The information was gathered from electronic medical registrations and case files. A semi-structured questionnaire was used to gather all pertinent sociodemographic, obstetric, and clinical data. Excluded instances included overt diabetes mellitus and persistent hypertension. An electronic digital scale was used to record the weight during every prenatal visit and during delivery. GDM and gestational hypertension were the outcomes that were sought after. GDM and gestational hypertension were measured using accepted references.<sup>[21]</sup> All patient identifiable information was protected during the data entry process. Before accessing and analyzing the data, consent from the institutional ethical committee was secured. The chi-square test was used to analyze the data. Version 20 of the SPSS (Statistical Package for Social Services) was used for all analysis.

## RESULTS

Table-1 & fig.-1 shows the 786 patients who came to the department were screened for the study. Insufficient data led to the exclusion of 145 patients. And because the inclusion condition wasn't met, 75 people were eliminated. The weight distribution of the 566 pregnant women who were evaluated is finally summarized.



**Figure 1:** Shows the distribution of participants according to BMI

Table-2 & 3 shows the 79.06% of the underweight women showed weight gain below the IOM range, indicating that none of them gained enough weight. 2.38% of the underweight women had gained too much weight. Mothers who were overweight or obese had high GWG (66.7%). Every woman who had a normal pregestational BMI gained weight normally.

Table-4 shows the 02(2.38%) of the recommended weight gain group developed GDM. 04(4.76%) of Women with less than recommended weight gain also developed GDM. 46(54.76%) mothers in more than recommended weight gain had GDM which was statistically significant ( $p < 0.01$ ). Gestational hypertension was significantly more in mothers with greater than recommended weight gain (25.0%;  $p = 0.004$ ).

**Table 1: Distribution of participants according to BMI**

Body Mass Index (BMI)	No. of Participants (%)
Under weight	70 (12.36%)
Normal	428 (75.61%)
Over weight	50 (8.83%)
Obese	18 (3.18%)
Total	566 (100.0%)

**Table 2: Shows the weight gain among different groups**

Weight gain	No. of Participants (%)
Recommended weight gain	396 (70.08%)
Less than recommended weight gain	86 (15.22%)
More than recommended weight gain	84 (14.86%)
Total	566 (100.0%)

**Table 3: Shows the comparison of total weight gain to BMI**

Body Mass Index (BMI)	Recommended weight gain (N=396)	Less than recommended weight gain (N=86)	More than recommended weight gain (N=84)
Under weight	0 (0.0%)	68 (79.06%)	02 (2.38%)
Normal	396 (100%)	06 (6.97%)	26 (30.95%)
Over weight	0 (0.0%)	12 (13.95%)	56 (66.7%)

**Table 4: Shows the comparison of GDM and gestational hypertension to weight gain**

Medical complication observed	Recommended weight gain	Less than recommended weight gain	More than recommended weight gain	P-Value
GDM	02(2.38%)	04(4.76%)	46(54.76%)	<0.01
GHT	0(0.0%)	11(13.09%)	21 (25.0%)	0.04

## DISCUSSION

Pregnancy-related obesity varies from 1.8% to 25.3%.<sup>[1]</sup> There were 50 (8.83%) overweight and 18 (3.18%) obese women in our study. According to our findings, there is a high-risk correlation between obesity and overweight and gestational hypertension. According to our findings, 12 (13.95%) overweight people, 06 (6.97%) normal weight people, and 68 (79.06%) underweight pregnancies had insufficient GWG. Every woman having a normal pre-pregnancy BMI had a sufficient GWG. Pregnant overweight women 56 (66.7%) were more likely to have further excessive GWG than normal weight women 26 (30.95%) or underweight women 02 (2.38%). Higher BMI groups had higher GWG, indicating that women who are overweight or obese are more likely to have GWG that exceeds recommended levels. Both high and low GWG might have negative effects on a pregnancy. Numerous studies support this by demonstrating that pregnant women who gain weight beyond what is advised are more likely to experience pregnancy problems.<sup>[22]</sup> Additionally, our research demonstrated a link between pregnancy-related hypertension problems and excessive weight gain. Increased GWG was linked to a higher risk of preeclampsia, according to a previous study.<sup>[23]</sup> No mother in our study group exhibited pre-eclampsia despite being advised to gain weight. According to a previous study, the risk of hypertensive problems increased 1.92 times in people who gained more weight than the IOM suggested.<sup>[24]</sup> In our study 02(2.38%) of the recommended weight gain group developed GDM. 04(4.76%) of Women with less than recommended weight gain also developed GDM. 46(54.76%) mothers in more than recommended weight gain had GDM which was statistically significant. Previous studies produced similar findings. Additionally, Liu et al. demonstrated that whereas insufficient GWG raised the risk of GDM, adequate GWG was linked to a lower incidence of GDM.<sup>[25]</sup>

## CONCLUSION

Approximately three fourth of the prenatal patients experienced a typical increase in weight. It was advised that patients with normal BMIs gain weight. GWG was higher in the majority of women with high BMI and lower in the majority of women with low pre-pregnancy BMI. High prenatal BMI and higher than advised GWG were linked to gestational hypertension. With the recommended weight increase, no moms experienced gestational

hypertension. GDM developed in all women with recommended and less than suggested GWG, however it was most common in the group of women with more than recommended GWG. Gestational diabetes mellitus and gestational hypertension can be reduced in incidence by prenatal nutritional counseling, physical activity, and lifestyle changes. To lower the risk of these issues, attempts should be made to lose weight before becoming pregnant and to manage high GWG while pregnant.

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