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Prevalence of Gestational Hypertensive Disorder in Overweight and Obese Antenatal Women in a Tertiary Care Centre

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ABSTRACT:
Introduction: *Hypertensive disorders of pregnancy constitute a substantial global burden contributing to maternal and perinatal morbidity & mortality. The increasing prevalence of obesity among women of reproductive age further predisposes them to gestational hypertensive disorders and adverse pregnancy outcomes. This study aimed to estimate the prevalence of hypertensive disorders in pregnancy with elevated pre-pregnancy BMI and to evaluate maternal and fetal outcomes in a tertiary care centre.*
Materials & methods: *This retrospective, hospital-based, cross-sectional study was conducted in the Department of Obstetrics & Gynaecology, Chettinad Hospital and Research Institute (CHRI), between June 2023 to June 2025, and enrolled 202 pregnant women classified as overweight or obese. Variables required for the study were collected from existing hospital records. Prevalence of hypertensive disorders in pregnancy and various maternal & fetal complications were taken as study outcomes. Data were analysed using SPSS software version 25.0.*
Results: *In our present study, the prevalence of hypertensive disorders in pregnancy (HDP) was 51.4% (n = 104), out of 202 patients. Most of the participants (67.82%) (n = 137) belonged to the 21-30 years age group, and 48.51% (n = 98) fell under the socioeconomic status class III of the modified Kuppuswamy classification. 53.96% participants (n = 109) had more than the recommended weight gain during pregnancy. Among the 104 patients with hypertensive disorders of pregnancy, 48.07% women (n = 50) had gestational hypertension, followed by non-severe pre-eclampsia among 25% patients (n = 26). Regarding maternal complications, 9.61% patients (n = 10) had gestational diabetes mellitus (GDM), 1.92% women (n = 2) had abruptio placentae, and 9.61% women (n = 10) had postpartum infection. However, the majority of participants didn't have any antepartum, intrapartum, or postpartum complications. With respect to fetal complications, 26.92% women (n = 28) with HDP had preterm delivery, and 24.03% women (n = 25) had fetal distress. 47 babies required NICU admission, among which 53.19% of newborns (n = 25) were admitted for preterm care.*
Conclusion: *Overweight and obese pre-pregnancy BMI significantly increases the likelihood of developing hypertensive disorders in pregnancy. These disorders can result in various adverse consequences for both the pregnant mothers and their newborns.*
Keywords: *Body mass index, Eclampsia, Hypertension, Obesity, Pregnancy*

INTRODUCTION:

Hypertensive disorders of pregnancy, such as pre-eclampsia, represent a significant complication, affecting 2-5% of pregnancies worldwide. [1] These disorders are responsible for approximately 14% of pregnancy-related mortalities. [2] Pre-eclampsia elevates the potential for adverse outcomes in both the mother and the offspring, including augmented susceptibility to cardiovascular disease in subsequent stages of life. [3] Globally, obesity represents an increasing health concern. Data indicate a substantial elevation in the prevalence of obesity among adult females, climbing from 29.8% in 1980 to 38% in 2013. [4] Gestational diabetes and hypertension are among the augmented risks confronting pregnant women with elevated body mass index (BMI). [5, 6] Furthermore, maternal obesity is associated with a greater incidence of

perinatal issues and unfavorable birth outcomes. [7]

Preeclampsia and gestational hypertension represent multifaceted conditions with limited preventive strategies. Elevated pre-gestational body mass index (BMI) stands out as a significant, modifiable risk

factor. [8] Research demonstrates a definitive correlation between increased BMI and an augmented likelihood of preeclampsia development. [9]

A 2014 global estimate indicated that approximately 38.9 million pregnant women were classified as overweight or obese. In India specifically, over one-fifth (21.7%) of women fell under the overweight or obese category, including 4.3 million pregnant women with obesity. [10] This increasing prevalence presents heightened hazards for both maternal and infant health outcomes. [11]

Maternal obesity elevates the likelihood of significant complications, exhibiting an increased odds ratio for perinatal mortality. [12] It is associated with 25% of fetal deaths occurring at term. These risks underscore the importance of improved strategies for addressing obesity during pregnancy. [13]

Existing research frequently emphasizes less severe forms of pre-eclampsia and gestational hypertension. Nevertheless, critical manifestations present the most substantial hazards, such as preterm birth and fetal growth restriction. [14] A considerable number of these studies are limited by ambiguous diagnostic criteria or inadequate pre-gestational body mass index assessments. [15]

The American College of Obstetricians and Gynecologists advocates for preconception counselling for women who exhibit a body mass index of 25 or greater. [16] While reducing body mass before conception is generally encouraged, empirically validated weight management methodologies for expectant women remain limited. The National Institutes of Health proposes a 10% decrement in weight for non-pregnant women. [17]

Gestational hypertensive disorders (GHD) represent a significant burden on maternal and perinatal well-being, affecting approximately 10% of pregnancies. [18] Existing research indicates a positive correlation between elevated pre-gestational body mass index and the likelihood of developing GHD, as well as associated adverse sequelae such as cesarean delivery. [19] This study seeks to determine the prevalence of GHD among pregnant women with pre-existing overweight or obese conditions in India, and to evaluate maternal and fetal health outcomes.

OBJECTIVES:

1. To estimate the prevalence of hypertensive disorders among pregnant women with high pre-pregnancy BMI
2. To assess the maternal and fetal complications among pregnant women with high pre-pregnancy BMI

METHODOLOGY:

Study design, setting, and duration:

This retrospective, hospital-based, cross-sectional study was conducted in the Department of Obstetrics & Gynaecology at Chettinad Hospital and Research Institute (CHRI) located in Kelambakkam. Data were gathered for the study from hospital records between June 2023 to June 2025, over two years.

Study population (Inclusion and exclusion criteria):

Antenatal mothers aged 18-45 years who had a singleton pregnancy were included. Women with Type 2 diabetes mellitus, chronic hypertension, and chronic systemic illnesses (renal disease, autoimmune disorders) were excluded from the study.

Sample size:

Based on the study by the American College of Obstetricians and Gynecologists [1], the prevalence of pre-eclampsia in overweight women was 5%. Considering it with a 95% confidence interval, and an absolute precision of 3%, the sample size is calculated as,

$$n = \frac{(Z_{1-\alpha/2})2\ pq}{d^2}$$

$$n = \frac{(1.96)2 * 5 * 95}{3*3}$$

$$n \sim 202.75$$

Hence, 202 participants were selected for the study.

Procedure:

Data were collected from existing hospital records of pregnant women who satisfied the inclusion criteria within the study period. Details such as demographic profile, anthropometric measurements, and blood pressure values were collected from the parturition register and patient case sheets. BMI was calculated from the anthropometric values (height and weight) and categorized into overweight and obese, according

to the WHO classification. Pre-pregnancy weight was noted, from which the pre-pregnancy BMI and weight gain during pregnancy were calculated.

The cut-off points considered for underweight & normal BMI categories are <24.9 kg/m^2, and the cut-off points taken for overweight & obesity categories are >25kg/m^2. Only women who were categorized as overweight and obese were included in the analysis.

Maternal outcomes such as gestational hypertension, preeclampsia, eclampsia, mode of delivery, and complications, along with neonatal outcomes such as fetal distress, preterm birth, fetal growth restriction, and NICU admissions, were recorded.

Outcomes measured:

Primary outcome:

- Prevalence of gestational hypertensive disorders (gestational hypertension, preeclampsia, and eclampsia) among overweight and obese antenatal women.

Secondary outcomes:

a) Maternal outcomes:

Incidence of complications such as abruptio placentae, preterm labour, and postpartum hemorrhage.

b) Fetal/neonatal outcomes:

Incidence of preterm birth, fetal growth restriction, and NICU admission.

Statistical analysis:

The collected data were entered in a Microsoft Excel sheet and analysed using IBM-SPSS software version 25.0. Descriptive analysis was expressed by mean and standard deviation for quantitative variables. Categorical variables were described by frequency and percentage.

Ethical consideration:

Ethical clearance was obtained from the Institutional Human Ethics Committee (IHEC) of Chettinad Hospital and Research Institute (CHRI) before the initiation of the study (Ref no: IHEC-II/0938/25). Since this is a retrospective record-based study with no direct patient contact or intervention, there were no risks involved for participants. A waiver of consent was requested as only existing hospital records were analyzed. Confidentiality was maintained by removing personal identifiers and coding data. Information was stored securely with access limited to investigators.

RESULTS:

Overall, 202 participants were recruited for the study.

Table 1: Socio-demographic profile of the participants (N=202)

Age-wise distribution		
Age (Years)	**Frequency**	**Percentage**
<20	4	1.98%
21-30	137	67.82%
31-40	57	28.22%
40-50	4	1.98%
Total	202	100.00%
Socio-economic status		
Socio-economic status	**Frequency**	**Percentage**
I	0	-
II	42	20.79%
III	98	48.51%
IV	54	26.7%
V	8	4.0%

Total	202	100.00%

Table 1 represents the socio-demographic characteristics of the participants. The current study revealed that the predominant age group was between 21-30 years (n = 137) (67.82%), followed by 31-40 years (n = 57) (28.22%). Furthermore, most participants were categorized within socioeconomic class III (n = 98) (48.51%) of the modified Kuppuswamy scale, followed by class IV (n = 54) (26.7%), reflecting the study's conduct within a tertiary care hospital.

Figure 1: Prevalence of hypertensive disorders in pregnancy (HDP) (N=202)

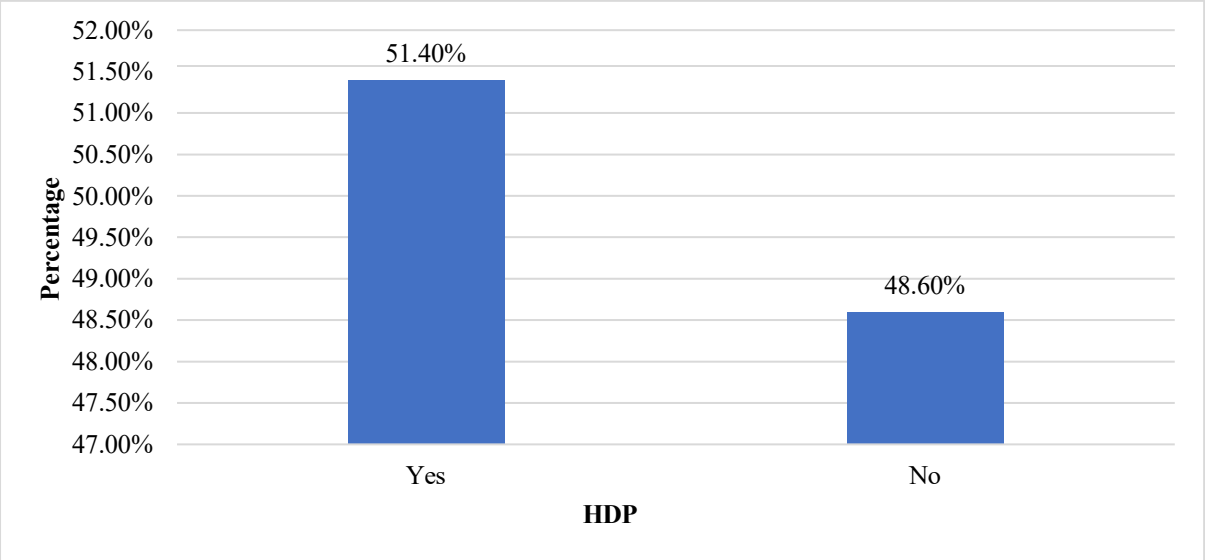

Figure 1 exhibits the prevalence of hypertensive disorders in pregnancy (HDP) among the study participants. Over half of the participants (51.4%) (n = 104) were diagnosed with HDP. The remaining population (48.6%) (n = 98) had normal blood pressure values. Hence, the observed prevalence of HDP within this study population was 51.4%.

Table 2: Classification of hypertensive disorders in pregnancy (HDP) (n=104)

HDP classification	**Frequency**	**Percentage**
Gestational hypertension	50	48.07%
Non-severe pre-eclampsia	26	25%
Severe pre-eclampsia	15	14.42%
Imminent eclampsia	8	7.69%
Eclampsia	3	2.88%
Chronic HTN superimposed pre-eclampsia	2	1.92%
Total	104	100%

Table 2 presents the distribution of participants according to the HDP classification. Out of the 104 patients with hypertensive disorders in pregnancy, almost half of the patients (48.07%) (n = 50) had gestational hypertension, 25% patients (n = 26) had non-severe pre-eclampsia, and only 14.42% patients (n = 15) were found to have severe pre-eclampsia.

Figure 2: Distribution of weight gain during pregnancy (N = 202)

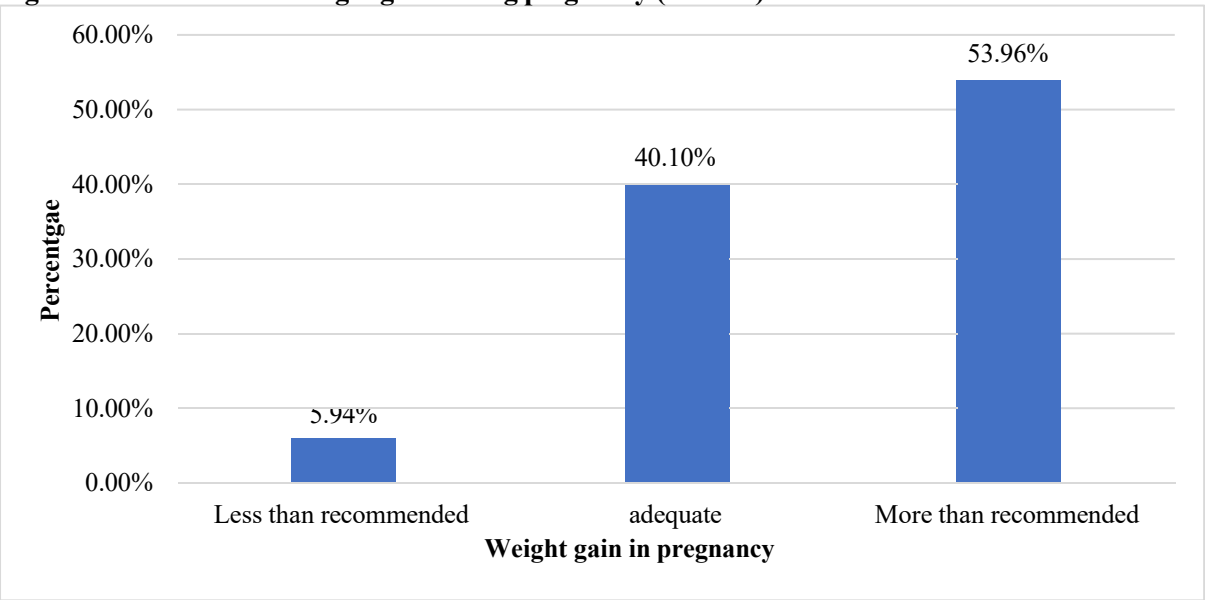

Figure 2 illustrates the distribution of weight gain among the participants during pregnancy. Among the 202 subjects in the study, a substantial proportion of the participants (53.96%) (n = 109) exhibited weight gain exceeding recommendations. A considerable percentage (40%) (n = 81) demonstrated weight gain within the appropriate range, while a small fraction (5.94%) (n = 12) experienced insufficient weight gain during pregnancy.

Figure 3: Distribution of the mode of delivery among women with HDP (n=104)

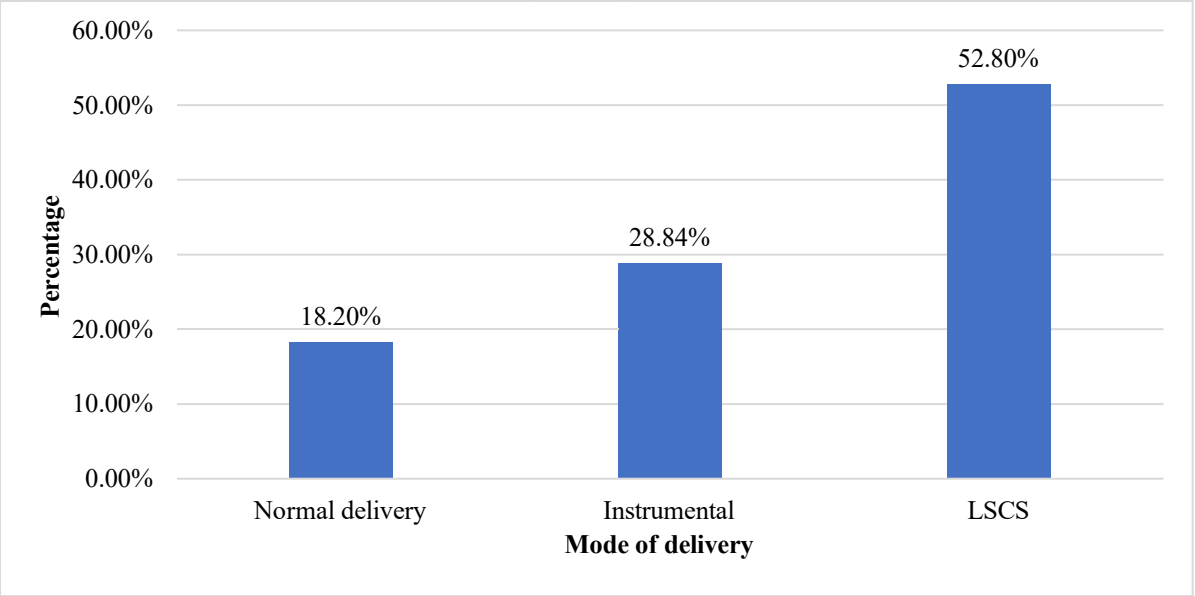

Figure 3 demonstrates the distribution of the mode of delivery among patients with hypertensive disorders of pregnancy. Among the 104 participants, over half of the patients (52.8%) (n = 55) underwent lower segment caesarean section (LSCS), 28.84% patients (n = 30) underwent instrumental delivery, and only 18.2% patients (n = 19) underwent a normal delivery.

Table 3: Distribution of maternal complications among women with HDP (n = 104)

Antepartum complications	**Frequency**	**Percentage**
Imminent eclampsia	2	1.92%
Antepartum eclampsia	3	2.88%
Uncontrolled hypertension	3	2.88%
Gestational diabetes mellitus (GDM)	10	9.61%
HELLP syndrome	3	2.88 %
Peripartum cardiomyopathy	2	1.92%
No antepartum complications	81	77.88%
Intrapartum complications	**Frequency**	**Percentage**
Abruptio placenta	2	1.92%
Intrapartum eclampsia	0	0%
No intrapartum complications	102	98.08%
Postpartum complications	**Frequency**	**Percentage**
Postpartum eclampsia	0	0
Postpartum hemorrhage	6	5.76%
Postpartum infection	10	9.61%
No post-partum complications	88	84.61%

Table 3 summarizes the distribution of maternal complications among women with HDP. Regarding the antepartum maternal complications, the majority of the participants (77.88%) (n = 81) didn't have any antepartum complications, and 9.61% patients (n = 10) were affected by GDM.
With respect to intrapartum maternal complications, only 1.92% of the patients (n = 2) had abruptio placentae, and the remaining participants (98.08%) (n = 102) didn't have any intrapartum complications. During the postpartum period, most of the patients (84.61%) (n = 88) didn't have any postpartum complications, and 9.61% of the participants (n = 10) suffered from postpartum infection.

Table 4: Distribution of fetal/neonatal complications in the study population (n = 104)

Antenatal fetal complications	**Frequency**	**Percentage**
Fetal growth restriction (FGR)	10	9.61%
Intrauterine death (IUD)	4	3.84%
Preterm delivery	28	26.92%
No antenatal fetal complications	57	54.8%
Perinatal complications	**Frequency**	**Percentage**
Fetal distress	25	24.03%

Perinatal hypoxia	15	14.4%
No perinatal complications	64	61.53%

Table 4 summarizes the distribution of fetal/neonatal complications among the study population. Regarding the antenatal fetal complications, more than half of the participants (54.8%) (n = 57) didn't have any complications, and 26.92% participants (n = 28) underwent preterm delivery.
With respect to perinatal complications, 61.53% participants (n = 64) didn't have any complications, 24.03% participants (n = 25) had fetal distress, and 14.4% participants (n = 15) had perinatal hypoxia.

Table 5: Reasons for NICU admission among neonates (n = 47)

Reason for NICU admission	**Frequency**	**Percentage**
Preterm	25	53.19%
Stillborn	4	8.51%
Respiratory distress syndrome (RDS)	8	17.02%
Hyperbilirubinemia	3	6.38%
Hypoglycemia	2	4.26%
Low birth weight	5	10.6%

Table 5 demonstrates the various reasons for which neonates were admitted to the NICU. More than half of the neonates (53.19%) (n = 25) were admitted to the NICU for preterm care, 17.02% newborns (n = 8) were admitted for respiratory distress syndrome, and 10.6% newborns (n = 5) were admitted for low birth weight.

DISCUSSION:
Over the last three decades, the prevalence of obesity has risen steadily, with a particularly notable increase observed in India. This condition is associated with a range of negative health consequences, including cardiovascular diseases, metabolic disorders, an elevated risk of cancers, and psychological & social difficulties. Diminished quality of life and life expectancy are increasingly linked to obesity, a prevalent condition affecting individuals across all ages and genders. However, obesity in and during the reproductive years is of particular concern due to its potential to impact the health trajectories of subsequent generations. [20]
Hypertensive disorders in pregnancy (HDP) encompass a spectrum of conditions characterized by elevated blood pressure during pregnancy, often accompanied by proteinuria and, in severe instances, seizures. Gestational hypertension, pre-eclampsia, and eclampsia (PE&E) constitute the predominant forms of HDP. PE&E can result in significant adverse outcomes for both maternal and fetal health. [21]
Globally, hypertensive disorders in pregnancy (HDP) are common, potentially affecting 5–10% of all pregnancies. HDP contributes significantly to maternal mortality, accounting for 12–25% of such deaths during pregnancy and the puerperium. Preeclampsia and eclampsia (PE&E) represent major risks to maternal well-being, particularly in developing nations, where the likelihood of a woman experiencing these conditions is increased sevenfold. [22]
Therefore, the purpose of this study was to determine the prevalence of hypertensive disorders among pregnant women classified as overweight or obese, and to subsequently analyze associated maternal and neonatal consequences within a tertiary care centre.
The present study involved 202 participants, of whom 104 were diagnosed with hypertensive disorder in pregnancy (HDP), while 98 exhibited normotensive status. Consequently, the proportion of HDP within the study population was determined to be 51.4%.

Objective assessments indicate the presence of both structural and functional cardiac abnormalities among women during pregnancies affected by preeclampsia. [23, 24] While preeclampsia was evident within the study population, peripartum cardiomyopathy was diagnosed in only two individuals.

The study comprised 202 overweight and obese pregnant women. The predominant age demographic, representing 67.82% of the population, was between 21 to 30 years of age. Participants aged 31 to 40 years comprised 28.22% of the group. Marginal proportions of the sample consisted of older (approximately 2%) and teenage (approximately 2%) pregnancies. A study by Madi et al. [11] indicated that women older than 35 years of age exhibited a 2.5-fold increased probability of obesity compared to their younger counterparts. Furthermore, Duckett et al. [25] identified teenage pregnancy as a significant risk factor for pregnancy-induced hypertension (PIH) and eclampsia.

Another study by Khasay et al. [26] determined that women with elevated pre-pregnancy body mass index had a significantly increased likelihood of developing hypertensive disorders in pregnancy compared to those with lower or normal body mass index, which is also in agreement with reports from the USA. [27, 28] Correspondingly, in our research, all participants were overweight and obese, and hypertensive disorders in pregnancy were found at a significant rate (51.4%).

The current investigation revealed that gestational hypertension was the most frequent hypertensive disorder in pregnancy (48.07%), followed by non-severe pre-eclampsia (25%), and severe pre-eclampsia (14.42%). A smaller proportion of participants presented with imminent eclampsia (7.69%), eclampsia (2.88%), and chronic hypertension with superimposed pre-eclampsia (1.92%). Similar results were documented in the study by Jay Raman et al. [29], which indicated that mild, moderate, and severe pregnancy-induced hypertension constituted 59.6%, 22%, and 18.4% of the 245 cases, respectively.

Our research identified ten individuals with gestational diabetes mellitus (GDM), five with imminent eclampsia, five with uncontrolled hypertension, three with antepartum eclampsia, three with HELLP syndrome, and two with peripartum cardiomyopathy. A prior investigation by Farid M et al. [30] documented significant morbidities among women with eclampsia, including abruptio placenta (10%), HELLP syndrome (11%), disseminated intravascular coagulopathy (6%), neurological deficits and aspiration pneumonia (7%), pulmonary edema (5%), cardiopulmonary arrest (4%), acute renal insufficiency (4%), and mortality (1%). Their findings indicated a significant positive correlation between maternal complications and the severity of pregnancy-induced hypertension (PIH). In contrast, our current study observed only five cases of imminent eclampsia, with no maternal deaths. Nevertheless, the presence of PIH potentially contributed to preterm birth and intrauterine growth restriction in the study.

Regarding the fetal complications in our investigation, a notable proportion (26.92%) experienced preterm birth (n = 28). Furthermore, fetal growth restriction was observed in 9.61% of cases (n=10), while a smaller subset (4.80%) (n=5) resulted in neonates with low birth weight. There were four stillborn cases. The majority of the participants (n=34) did not report any complications. Regarding intrapartum events, abruptio placenta was documented in a limited number of participants (1.92%) (n=2), and no cases of intrapartum eclampsia were identified.

In our study, 25 patients experienced fetal distress, while 15 patients had perinatal hypoxia during labour. Postpartum complications included 6 people with postpartum hemorrhage and 10 women with postpartum infection. These findings align with prior research by Buchbinder et al. [31], which demonstrated that individuals with gestational hypertension or preeclampsia also present with notably elevated frequencies of preterm delivery and the delivery of small for gestational age infants.

This investigation revealed that 47 neonates required neonatal intensive care unit (NICU) admission, with 25 admitted for preterm care, 10 for respiratory distress syndrome (RDS), 5 for hyperbilirubinemia, and 3 for hypoglycemia. Similar findings were reported in the study by Krithika et al. [32]; however, their data showed a disparity, with 24 neonates (25.53%) of affected mothers requiring NICU admission compared to 11 neonates (11.2%) of control mothers. Wolde Z et al. [33] noted in their research that 22.52% of live births necessitated NICU admission, and 9% ultimately resulted in neonatal death. Conversely, Pawar DS et al. [34] found a higher NICU admission rate of 34.6% among live babies born to mothers with hypertensive disorders in pregnancy.

STRENGTHS:

The present study addresses an important public health concern by focusing on the high-risk subgroup of overweight and obese antenatal women, thereby generating context-specific prevalence data on hypertensive disorders of pregnancy. Its strength lies in the relatively robust sample size with detailed stratification of maternal and fetal outcomes, which enhances the reliability of observed associations. The

use of a tertiary care setting ensures comprehensive clinical documentation, allowing for accurate classification of the spectrum of hypertensive disorders and related complications. Furthermore, the inclusion of both maternal and neonatal outcome measures provides a holistic perspective on the burden of the disease in this vulnerable population.

LIMITATIONS:

Despite these strengths, the study has certain limitations, as potentially confounding variables such as maternal occupation, lifestyle behaviours like smoking, diet pattern, and the influence of physical activity on maternal weight dynamics could not be included, due to the retrospective nature. Finally, the generalizability of the findings is limited due to the study population's concentration in an urban, middle-class socioeconomic stratum within a tertiary healthcare centre, thereby failing to reflect the diversity of the broader Indian population.

CONCLUSION:

This investigation aimed to determine the relationship between elevated pre-pregnancy BMI and the development of pregnancy-induced hypertension, as well as its maternal and neonatal outcomes. The findings indicated that a significant proportion of women with higher BMIs gained more than the recommended gestational weight gain.

Pregnant women classified as overweight or obese exhibited a substantial risk of pregnancy-associated hypertension (gestational hypertension/preeclampsia), assisted vaginal delivery, and cesarean delivery. These potentially amenable adverse outcomes warrant prioritized focus in antenatal care protocols.

Future research with a greater study population across both primary and secondary healthcare facilities is necessary to elucidate the long-term effects of gestational weight gain on postpartum weight retention and childhood obesity. Moreover, revised consensus guidelines for BMI, focusing on the Asian population, should be implemented in lieu of WHO BMI classifications, as the latter may lead to an underestimation of the prevalence of overweight and obese women, thereby resulting in a subsequent underestimation of associated risks. Additional research focused on developing nation-specific guidelines is crucial for optimizing gestational weight gain recommendations within the context of our country.

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