SJ Gynecology and Obstetrics Africa
Vol. 3 No. 2 (2026): May 2026 Issue
https://doi.org/10.51168/46e3fb72
Original Article

Maternal BMI and hypertensive disorders of pregnancy: A cross-sectional observational analytical study in a tertiary care centre.

Ashwini Ganeshrao Gaikwad[1]*, Jagruti Ratnakar Keskar[1], Deepak Ashok Kubde[2]
[1]Assistant Professor, Department of Obstetrics and Gynaecology, Parbhani Medical College, R. P. Hospital & Research Institute, Parbhani, Maharashtra, India.
[2]Assistant Professor, Department of General Medicine, Parbhani Medical College, R. P. Hospital & Research Institute, Parbhani, Maharashtra, India.

Abstract

Background:
Maternal body mass index is a practical antenatal marker that reflects nutritional and metabolic status. Excess BMI is linked with endothelial dysfunction, insulin resistance, inflammation, and increased risk of hypertensive disorders of pregnancy.

Objectives:
To assess the distribution of maternal BMI and determine its association with hypertensive disorders of pregnancy among pregnant women attending a tertiary care centre.

Methods:
This observational analytical study was conducted at RP Hospital, Parbhani, Maharashtra, India, from September 2025 to February 2026. A total of 100 pregnant women were included. Maternal BMI was categorized as underweight, normal, overweight, and obese. Hypertensive disorders were classified as gestational hypertension, mild preeclampsia, severe preeclampsia, and eclampsia. Associations were analysed using appropriate statistical tests and logistic regression.

Results:
The mean maternal age was 26.8 ± 4.5 years, and the mean BMI was 25.4 ± 4.2 kg/m². Overall, 8.0% were underweight, 40.0% had normal BMI, 34.0% were overweight, and 18.0% were obese. Hypertensive disorders were present in 29.0% of participants. Their prevalence increased from 15.0% in normal BMI women to 35.3% in overweight women and 55.6% in obese women. Obesity showed a significant adjusted association with hypertensive disorders. Preterm delivery and low birth weight were also more frequent among affected women.

Conclusion:
Increasing maternal BMI was significantly associated with hypertensive disorders of pregnancy and selected adverse perinatal outcomes.

Recommendations:
Early BMI assessment, weight counselling, blood pressure surveillance, and risk-based antenatal follow-up should be integrated into routine obstetric care.

Keywords: *Maternal body mass index; hypertensive disorders of pregnancy; gestational hypertension; preeclampsia; obesity; pregnancy outcomes.*
Submitted: *March 11, 2026* ***Accepted:*** *April 07, 2026* ***Published:*** *May 30, 2026*

Corresponding Author: *Dr. Ashwini Ganeshrao Gaikwad*
Email: *ashwini.Gaikwad95@gmail.com*
Assistant Professor, Department of Obstetrics and Gynaecology, Parbhani Medical College, R. P. Hospital & Research Institute, Parbhani, Maharashtra, India.

Introduction
Hypertensive disorders of pregnancy are a major contributor to maternal and perinatal morbidity worldwide. They include gestational hypertension, preeclampsia, eclampsia, and related severe disease forms that can progress rapidly when diagnosis and monitoring are delayed. Global estimates show that preeclampsia and eclampsia continue to affect a substantial proportion of pregnancies, with a heavier impact in low- and middle-income settings because of late referral, limited surveillance, and delayed access to emergency obstetric care [1]. Contemporary classification systems emphasize accurate blood pressure measurement, proteinuria assessment, and evaluation of maternal organ dysfunction because the clinical spectrum extends beyond isolated hypertension [2,3].

https://doi.org/10.51168/46e3fb72
Original Article

Maternal body mass index (BMI) is one of the simplest measurable indicators available during antenatal care. It provides useful information on nutritional status, adiposity-related metabolic risk, and baseline obstetric vulnerability. Although BMI does not measure body composition directly, it remains widely used in clinical practice because it is inexpensive, reproducible, and easy to document during the first antenatal visit. Excess maternal BMI has been associated with insulin resistance, dyslipidaemia, chronic low-grade inflammation, oxidative stress, and endothelial dysfunction. These biological changes overlap with the pathophysiological pathways involved in preeclampsia and gestational hypertension [4,5].

Evidence from systematic reviews and cohort studies shows a consistent dose-response relationship between increasing prepregnancy or early-pregnancy BMI and the risk of preeclampsia. Some studies reported the risk of preeclampsia doubled with every 5-7 kg/m² rise in prepregnancy BMI in pooled observational data [4]. Later meta-analyses confirmed that overweight and obesity increase the likelihood of preeclampsia when compared with normal BMI [5,6]. Large individual participant data analyses also demonstrated that higher maternal BMI and excessive gestational weight gain are associated with gestational hypertensive disorders and other pregnancy complications [7].

The burden of abnormal BMI during pregnancy is especially relevant in India, where undernutrition and increasing overweight coexist within the same population. Indian obstetric practice, therefore, requires local evidence that examines not only obesity but also the full BMI distribution. Studies from South Asian populations have shown that high BMI in early pregnancy is associated with adverse maternal, perinatal, and neonatal outcomes, including hypertensive disorders, caesarean delivery, and low birth weight [12,13]. However, hospital-based data remain important because patient profiles differ according to region, referral pattern, and access to antenatal care.

The present study was conducted with the objective of assessing the distribution of maternal BMI among pregnant women attending RP Hospital Parbhani, Parbhani, Maharashtra, India, and evaluating the association between BMI categories and hypertensive disorders of pregnancy. The secondary objective was to compare selected maternal and perinatal outcomes among women with and without hypertensive disorders of pregnancy.

Materials and Methods

Study design and setting

This observational analytical study was conducted in the Department of Obstetrics and Gynaecology at RP Hospital, Parbhani, Maharashtra, India. The hospital serves as a tertiary care centre for urban and semi-urban populations and receives both booked antenatal women and referred obstetric cases. The study period extended from September 2025 to February 2026.

Study population

A total of 100 pregnant women who attended antenatal care or were admitted for obstetric management during the study period were included. The sample comprised eligible women with singleton pregnancy and complete clinical records for maternal age, gravidity, BMI, blood pressure status, and pregnancy outcome variables. Women with incomplete records, multiple pregnancy, known chronic renal disease, pre-existing cardiac disease, and previously diagnosed chronic hypertension before pregnancy were excluded to reduce confounding in the assessment of pregnancy-related hypertension.

Study size

The study size was calculated using the single-proportion formula for cross-sectional studies:

$n = Z^2pq / d^2$

where n is the required sample size, Z is the standard normal value at 95% confidence level (1.96), p is the expected prevalence, $q = 1 - p$, and d is the allowable margin of error. As no precise local estimate was available for the expected prevalence of hypertensive disorders of pregnancy in relation to maternal BMI, a prevalence of 50% was considered to obtain the maximum sample size. With 10% absolute precision, the calculated sample size was:

$n = (1.96)^2 \times 0.50 \times 0.50 / (0.10)^2 = 96.04$

The minimum required sample size was therefore 96 participants. This was rounded off to 100 pregnant women for better representation and feasibility during the study period.

BMI assessment

Maternal BMI was calculated using the formula weight in kilograms divided by height in metres squared. Weight and height were recorded using standard clinical procedures. Participants were classified into four BMI categories: underweight, normal BMI, overweight, and obese. BMI was analysed both as a categorical exposure and as a clinical risk indicator in relation to hypertensive disorders of pregnancy.

Assessment of hypertensive disorders

Blood pressure was measured using a calibrated sphygmomanometer after adequate rest, with the participant seated or in the appropriate antenatal position. Hypertensive disorders were classified according to standard obstetric criteria consistent with contemporary ACOG and ISSHP guidance [2,3]. Gestational hypertension was defined as new-onset hypertension after 20 weeks of gestation without proteinuria or severe features. Preeclampsia was diagnosed when hypertension was associated with proteinuria or relevant maternal organ involvement. Severe preeclampsia and eclampsia were recorded based on clinical severity and the occurrence of convulsions not attributable to other causes.

https://doi.org/10.51168/46e3fb72
Original Article

Outcome variables

The primary outcome was the presence of any hypertensive disorder of pregnancy. Secondary outcomes included caesarean delivery, preterm delivery, low birth weight, neonatal intensive care unit admission, and postpartum haemorrhage. Data were collected from antenatal records, labour room registers, inpatient case sheets, and neonatal records.

Bias

Potential sources of bias were addressed during the design, data collection, and analysis phases. Selection bias was minimized by including all eligible pregnant women who attended antenatal care or were admitted during the study period and fulfilled the inclusion criteria. Information bias was reduced by using standard clinical records, uniform BMI classification, calibrated blood pressure measurement, and predefined diagnostic criteria for hypertensive disorders of pregnancy. Observer-related variation was minimized by recording clinical parameters according to routine institutional protocols. Confounding was addressed by excluding women with chronic hypertension, renal disease, cardiac disease, and multiple pregnancy. In addition, logistic regression analysis was performed with adjustment for maternal age, gravidity, and gestational age at enrolment to improve the validity of the association between maternal BMI and hypertensive disorders of pregnancy.

Statistical analysis

Data were entered into a spreadsheet and analysed using descriptive and inferential statistics. Continuous variables were summarized as mean and standard deviation. Categorical variables were presented as frequency and percentage. Logistic regression was performed to estimate crude and adjusted odds ratios with 95% confidence intervals. Adjustment was done for maternal age, gravidity, and gestational age at enrolment. A p-value less than 0.05 was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the Institutional Ethics Committee of RP Hospital, Parbhani, Maharashtra, India, before initiation of the study. The study was conducted in accordance with institutional ethical standards and ethical principles for human research. Written informed consent was obtained from all participants before enrolment, and confidentiality of participant information was maintained throughout the study.

Results

A total of 100 pregnant women were included in the study. The mean maternal age was 26.8 ± 4.5 years. Most participants were aged 21-30 years. The mean body mass index was 25.4 ± 4.2 kg/m². Based on BMI classification, 8.0% were underweight, 40.0% had normal BMI, 34.0% were overweight, and 18.0% were obese. Primigravida women constituted 44.0% of the study population, while 56.0% were multigravida (Table 1).

Table 1. Baseline characteristics of the study population

Variable	Category / Value	Frequency / Mean	Percentage / SD
Total sample size	-	100	100.0
Age, years	Mean ± SD	26.8	±4.5
Age group	≤20 years	10	10.0
	21-25 years	36	36.0
	26-30 years	34	34.0
	>30 years	20	20.0
Gravidity	Primigravida	44	44.0
	Multigravida	56	56.0
BMI, kg/m²	Mean ± SD	25.4	±4.2
BMI category	Underweight	8	8.0
	Normal BMI	40	40.0
	Overweight	34	34.0
	Obese	18	18.0

Hypertensive disorders of pregnancy were observed in 29 women, giving an overall prevalence of 29.0%. Gestational hypertension was the most common condition, accounting for 13.0% of the total study population, followed by mild preeclampsia in 8.0%, severe preeclampsia in 6.0%, and eclampsia in 2.0% (Table 2).

https://doi.org/10.51168/46e3fb72
Original Article

Table 2. Pattern of hypertensive disorders of pregnancy

Hypertensive disorder	Frequency (n=100)	Percentage (%)
No hypertensive disorder	71	71.0
Gestational hypertension	13	13.0
Mild preeclampsia	8	8.0
Severe preeclampsia	6	6.0
Eclampsia	2	2.0
Total hypertensive disorders of pregnancy	29	29.0

The prevalence of hypertensive disorders increased progressively with higher BMI. Hypertensive disorders were seen in 12.5% of underweight women, 15.0% of women with normal BMI, 35.3% of overweight women, and 55.6% of obese women. The association between maternal BMI category and hypertensive disorders of pregnancy was statistically significant (p=0.009) (Table 3).

Table 3. Association between maternal BMI and hypertensive disorders of pregnancy

BMI category	Total women	HDP present n (%)	HDP absent n (%)	p-value
Underweight	8	1 (12.5)	7 (87.5)	
Normal BMI	40	6 (15.0)	34 (85.0)	
Overweight	34	12 (35.3)	22 (64.7)	
Obese	18	10 (55.6)	8 (44.4)	0.009
Total	100	29 (29.0)	71 (71.0)	

On logistic regression analysis, overweight and obese women had higher odds of developing hypertensive disorders of pregnancy compared with women having a normal BMI. After adjustment for maternal age, gravidity, and gestational age at enrolment, overweight women had 2.70 times higher odds, while obese women had 5.40 times higher odds of hypertensive disorders. The association was statistically significant for obesity (p=0.009) (Table 4).

Table 4. Logistic regression analysis for the association between BMI and hypertensive disorders of pregnancy

BMI category	Crude OR	Adjusted OR	95% CI	p-value
Normal BMI	1.00	1.00	Reference	-
Underweight	0.81	0.76	0.08-7.36	0.812
Overweight	3.09	2.70	0.89-8.19	0.079
Obese	7.08	5.40	1.51-19.31	0.009

Adverse maternal and perinatal outcomes were more frequent among women with hypertensive disorders of pregnancy. Caesarean delivery was observed in 55.2% of women with hypertensive disorders compared with 35.2% of normotensive women. Preterm delivery, low birth weight, and neonatal intensive care unit admission were also higher among women with hypertensive disorders. Preterm delivery and low birth weight showed statistically significant associations with hypertensive disorder status (Table 5).

Table 5. Maternal and perinatal outcomes according to hypertensive disorder status

Outcome	HDP present (n=29)	HDP absent (n=71)	p-value
Caesarean delivery	16 (55.2)	25 (35.2)	0.061
Preterm delivery	9 (31.0)	10 (14.1)	0.047
Low birth weight	11 (37.9)	13 (18.3)	0.034
NICU admission	8 (27.6)	9 (12.7)	0.073
Postpartum haemorrhage	3 (10.3)	4 (5.6)	0.405

Overall, the findings showed a significant positive association between increasing maternal BMI and hypertensive disorders of pregnancy. The burden was highest among obese women, and hypertensive disorders were linked with increased preterm delivery and low birth weight.

https://doi.org/10.51168/46e3fb72
Original Article

Discussion

The present observational analytical study demonstrated a clear relationship between increasing maternal BMI and hypertensive disorders of pregnancy. Among 100 pregnant women, 52.0% were either overweight or obese, indicating a substantial burden of excess BMI in the antenatal population. Hypertensive disorders were identified in 29.0% of participants. Their prevalence increased from 15.0% in women with normal BMI to 35.3% in overweight women and 55.6% in obese women, supporting BMI as a useful early risk marker.

These findings are consistent with evidence syntheses showing a dose-response association between BMI and preeclampsia. O'Brien et al. reported that preeclampsia risk rose with each 5-7 kg/m² increase in prepregnancy BMI [4]. Poorolajal and Jenabi, and He et al. also confirmed a higher risk among overweight and obese women [5,6]. Similar graded associations were reported by Bodnar et al., Sebire et al., Mrema et al., and Meazaw et al., including data from diverse population settings [8,9,11,14].

The association has plausible biological pathways. Adiposity is linked with insulin resistance, sympathetic activation, chronic inflammation, oxidative stress, altered adipokine expression, and endothelial injury. These mechanisms can impair vascular adaptation during pregnancy and contribute to abnormal placentation, increased vascular resistance, and hypertensive disease. Clinical risk factor reviews include high BMI among the strongest early predictors of preeclampsia [10]. ACOG and ISSHP guidance also support risk-based surveillance for women with features associated with hypertensive complications [2,3].

The outcome pattern deserves clinical attention. Women with hypertensive disorders had higher proportions of caesarean delivery, preterm delivery, low birth weight, and NICU admission. Preterm delivery and low birth weight reached statistical significance. These findings agree with multicentre and regional studies showing that elevated BMI and hypertensive disorders contribute to adverse maternal and neonatal outcomes [7,12,13]. The strong gradient in the present results also highlights the value of simple anthropometric screening in busy antenatal care units. Tertiary care protocols should therefore combine BMI assessment with repeated blood pressure monitoring and timely referral.

Generalizability

The results apply mainly to pregnant women attending tertiary care services in settings similar to RP Hospital Parbhani, where both routine antenatal attendees and referred obstetric cases are managed. Because the sample was hospital-based and limited to 100 participants, extrapolation to the wider community requires caution. Still, the biological direction of association is consistent with large international and South Asian studies, supporting relevance for comparable Indian antenatal populations.

Conclusion

This observational analytical study found a significant positive association between maternal BMI and hypertensive disorders of pregnancy. More than half of the participants were overweight or obese, and the prevalence of hypertensive disorders increased steadily across BMI categories. Obese women had the highest burden and showed significantly increased adjusted odds of hypertensive disorders compared with women having a normal BMI. Hypertensive disorders were also associated with higher frequencies of caesarean delivery, preterm delivery, low birth weight, and neonatal intensive care admission. These findings support routine BMI-based risk stratification during antenatal care, with closer surveillance for women having excess BMI to improve maternal and perinatal outcomes overall in daily clinical practice.

Limitations

This study was conducted in a single tertiary care centre with a sample size of 100 participants, limiting wider population inference. BMI was assessed categorically and did not include body composition or central adiposity measurements. Residual confounding from diet, physical activity, socioeconomic status, and previous gestational weight pattern was not fully assessed. The findings reflect facility-level referral patterns and documentation practices.

Recommendations

All pregnant women should undergo BMI assessment at booking and be classified into risk categories for structured antenatal monitoring. Overweight and obese women require repeated blood pressure measurement, urine protein assessment, counselling on a healthy diet, and guidance on appropriate gestational weight gain. Tertiary care centres should develop local protocols that integrate BMI with maternal age, gravidity, previous obstetric history, and metabolic risk factors. Community-level preconception counselling should emphasize weight optimisation before pregnancy and postpartum. Larger prospective multicentre studies are recommended to validate BMI thresholds, examine gestational weight gain, and assess interventions that reduce hypertensive complications in Indian pregnant women.

Acknowledgement

The authors acknowledge the support of the Department of Obstetrics and Gynaecology, RP Hospital Parbhani, and thank the participating women for their cooperation. Appreciation is also extended to the nursing staff and record section for assistance in data collection and documentation. Their contribution is sincerely acknowledged throughout the study period.

Abbreviations

ACOG, American College of Obstetricians and Gynecologists;

BMI, body mass index;
CI, confidence interval;
HDP, hypertensive disorders of pregnancy;
ISSHP, International Society for the Study of Hypertension in Pregnancy;
NICU, neonatal intensive care unit

Source of Funding
This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of Interest
The authors declare no conflict of interest.

Author contributions
AGG- Concept and design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. **JRK-** Statistical analysis and interpretation, revision of manuscript. **DAK-** QI project administration and data collection.

Data availability
Data is available upon request from the corresponding author.

Author Biography
Dr. Ashwini Ganeshrao Gaikwad is an Assistant Professor in the Department of Obstetrics and Gynaecology at Parbhani Medical College, R. P. Hospital & Research Institute, Parbhani, Maharashtra, India. Her academic and clinical work focuses on antenatal care, hypertensive disorders of pregnancy, maternal nutrition, and obstetric risk assessment. She is actively involved in undergraduate teaching, patient care, and clinical research related to maternal and perinatal outcomes.

Dr. Jagruti Ratnakar Keskar is an Assistant Professor in the Department of Obstetrics and Gynaecology at Parbhani Medical College, R. P. Hospital & Research Institute, Parbhani, Maharashtra, India. Her areas of interest include high-risk pregnancy, maternal health, fetal surveillance, and preventive obstetric care. She contributes to clinical teaching, obstetric services, and research activities aimed at improving pregnancy outcomes in tertiary care settings.

Dr. Deepak Ashok Kubde is an Assistant Professor in the Department of General Medicine at Parbhani Medical College, R. P. Hospital & Research Institute, Parbhani, Maharashtra, India. His clinical and academic interests include metabolic disorders, hypertension, cardiovascular risk assessment, and medical conditions complicating pregnancy. He is engaged in clinical care, medical education, and interdisciplinary research involving maternal metabolic health and systemic disease outcomes.

References
1. Abalos E, Cuesta C, Grosso AL, Chou D, Say L. Global and regional estimates of preeclampsia and eclampsia: a systematic review. Eur J Obstet Gynecol Reprod Biol. 2013;170(1):1-7. https://doi.org/10.1016/j.ejogrb.2013.05.005
2. Brown MA, Magee LA, Kenny LC, Karumanchi SA, McCarthy FP, Saito S, et al. Hypertensive disorders of pregnancy: ISSHP classification, diagnosis, and management recommendations for international practice. Hypertension. 2018;72(1):24-43. https://doi.org/10.1161/HYPERTENSIONAHA.117.10803
3. Gestational Hypertension and Preeclampsia: ACOG Practice Bulletin, Number 222. Obstet Gynecol. 2020;135(6):e237-e260. https://doi.org/10.1097/AOG.0000000000003891
4. O'Brien TE, Ray JG, Chan WS. Maternal body mass index and the risk of preeclampsia: a systematic overview. Epidemiology. 2003;14(3):368-374. https://doi.org/10.1097/00001648-200305000-00020
5. Poorolajal J, Jenabi E. The association between body mass index and preeclampsia: a meta-analysis. J Matern Fetal Neonatal Med. 2016;29(22):3670-3676. https://doi.org/10.3109/14767058.2016.1140738
6. He XJ, Dai RX, Hu CL. Maternal prepregnancy overweight and obesity and the risk of preeclampsia: a meta-analysis of cohort studies. Obes Res Clin Pract. 2020;14(1):27-33. https://doi.org/10.1016/j.orcp.2020.01.004
7. Santos S, Voerman E, Amiano P, Barros H, Beilin LJ, Bergström A, et al. Impact of maternal body mass index and gestational weight gain on pregnancy complications: an individual participant data meta-analysis of European, North American, and Australian cohorts. BJOG. 2019;126(8):984-995. https://doi.org/10.1111/1471-0528.15661
8. Bodnar LM, Ness RB, Markovic N, Roberts JM. The risk of preeclampsia rises with increasing prepregnancy body mass index. Ann Epidemiol. 2005;15(7):475-482. https://doi.org/10.1016/j.annepidem.2004.12.008
9. Sebire NJ, Jolly M, Harris JP, Wadsworth J, Joffe M, Beard RW, et al. Maternal obesity and pregnancy outcome: a study of 287,213 pregnancies in London. Int J Obes Relat Metab

Disord. 2001;25(8):1175-1182. https://doi.org/10.1038/sj.ijo.0801670

10. Bartsch E, Medcalf KE, Park AL, Ray JG; High Risk of Pre-eclampsia Identification Group. Clinical risk factors for pre-eclampsia determined in early pregnancy: systematic review and meta-analysis of large cohort studies. BMJ. 2016;353:i1753. https://doi.org/10.1136/bmj.i1753
11. Mrema D, Lie RT, Østbye T, Mahande MJ, Daltveit AK. The association between pre-pregnancy body mass index and risk of preeclampsia: a registry-based study from Tanzania. BMC Pregnancy Childbirth. 2018;18(1):56. https://doi.org/10.1186/s12884-018-1687-3
12. Short VL, Geller SE, Moore JL, McClure EM, Goudar SS, Dhaded SM, et al. The relationship between body mass index in pregnancy and adverse maternal, perinatal, and neonatal outcomes in rural India and Pakistan. Am J Perinatol. 2018;35(9):844-851. https://doi.org/10.1055/s-0037-1621733
13. De A, Nigam A, Sharma S, Anwar A. Comparison of feto-maternal outcomes among various BMI groups as per Asia Pacific standards: an observational retrospective comparative study in a private tertiary care center in Delhi. J Obstet Gynecol India. 2023;73(3):223-228. https://doi.org/10.1007/s13224-022-01739-3
14. Meazaw MW, Chojenta C, Muluneh MD, Loxton D. Systematic and meta-analysis of factors associated with preeclampsia and eclampsia in sub-Saharan Africa. PLoS One. 2020;15(8):e0237600. https://doi.org/10.1371/journal.pone.0237600

PUBLISHED DETAILS:

SJC PUBLISHERS COMPANY LIMITED

SJC Publishers Company Limited
TODAY AND TOMORROW

Catergory: Non Government & Non profit Organisation
Contact: +256 775 434 261 (WhatsApp)
Email:info@sjpublisher.org or studentsjournal2020@gmail.com
Website: https://sjpublisher.org
Location: Scholar's Summit Nakigalala, P. O. Box 701432,Entebbe Uganda, East Africa