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Characteristics of Pregnant Women with Hypertension During Pregnancy at Prof. Dr. Soekandar Hospital from January to June 2026: A Focus on Diabetes Mellitus Comorbidities

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ABSTRACT
Hypertensive Disorders in Pregnancy (HDP) remain a major contributor to maternal morbidity and mortality worldwide. This study aimed to analyze the characteristics of pregnant women with HDP at Prof. Dr. Soekandar Hospital, Mojokerto Regency, from January to June 2026, with particular attention to Diabetes Mellitus (DM) comorbidity. A retrospective descriptive observational study was conducted using medical records of 760 pregnant women. Total sampling was applied to all patients diagnosed with HDP. Data were analyzed descriptively based on age, parity, obesity status, and complications among patients with DM. A total of 191 HDP cases were identified, representing a prevalence of 25.13%, with the highest number recorded in May (37 cases). Most patients were aged 20–34 years (51.8%), followed by those aged >35 years (37.7%). Multigravida women predominated, accounting for 126 cases (66%), while obesity was identified in 116 cases (60.7%). Among 33 patients with DM, 25 (75.7%) progressed to severe preeclampsia. The findings indicate a relatively high prevalence of HDP, with reproductive-age, multigravida, and obese women comprising the majority of cases. The high proportion of patients with DM progressing to severe preeclampsia highlights the importance of glycemic screening and metabolic management as integral components of antenatal care.

Keywords: Hypertensive Disorders in Pregnancy, Preeclampsia, Multigravida, Obesity, Diabetes Mellitus.

I. Introduction

Hypertensive Disorders in Pregnancy (HDP) remain a global health crisis and continue to rank among the leading causes of maternal mortality, alongside hemorrhage and infection. According to various global studies, HDP affects approximately 5% to 10% of all pregnancies and accounts for approximately 14% of maternal deaths worldwide. The clinical spectrum of HDP is broad and dynamic, ranging from transient gestational hypertension and preeclampsia to eclampsia, characterized by seizures, as well as chronic hypertension that was present before conception but worsens during pregnancy, resulting in superimposed preeclampsia. From a pathophysiological perspective, the classical theory of preeclampsia focuses on the hypothesis of abnormal placentation. In normal pregnancy, extravillous trophoblasts invade the maternal

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spiral arteries and remodel these vessels from narrow, muscular arteries into dilated, low-resistance, sac-like structures. This process ensures an adequate and high-volume blood supply to support fetal growth. However, in preeclampsia, trophoblastic invasion is incomplete or shallow. Consequently, the spiral arteries retain their vasoreactive properties, resulting in placental hypoperfusion, ischemia, and chronic hypoxia. The ischemic placenta responds to this stress by releasing large amounts of anti-angiogenic factors into the maternal circulation, particularly soluble fms-like tyrosine kinase-1 (sFlt-1) and soluble endoglin (sEng). These molecules bind to and neutralize pro-angiogenic factors, such as Vascular Endothelial Growth Factor (VEGF) and Placental Growth Factor (PlGF), which are essential for maintaining the integrity of the maternal vascular endothelium. Systemic endothelial dysfunction subsequently produces the classical clinical manifestations of preeclampsia, including hypertension due to systemic vasoconstriction, proteinuria resulting from renal podocyte injury and glomerular capillary endotheliosis, and edema. Over the past decade, the etiological paradigm of HDP has shifted toward an increasing recognition of the dominant role of maternal metabolic dysfunction.

The exponential increase in the global prevalence of obesity, together with the rising prevalence of Diabetes Mellitus, including both pre-existing and gestational diabetes, has modified the classical risk profile for preeclampsia. Obesity induces a state of low-grade systemic inflammation through the production of cytokines by adipose tissue. Concurrently, Diabetes Mellitus contributes to oxidative stress and protein glycation, which can directly damage the vascular system even before conception occurs. As a regional referral hospital serving a densely populated area, Prof. Dr. Soekandar Regional General Hospital, Mojokerto Regency, plays a crucial role as a frontline healthcare facility in responding to and managing obstetric emergencies and high-risk pregnancy referrals. Understanding the characteristics of the local population is fundamental to improving the quality of healthcare services. Therefore, this study was primarily designed to analyze the demographic, obstetric, and clinical characteristics of patients with HDP at this institution during the first half of 2026. Furthermore, this study specifically aimed to examine the extent of the pathological association between Diabetes Mellitus comorbidity and the incidence of preeclampsia complications within this patient cohort. The burden of HDP in Indonesia is no less concerning than the global situation. Based on systematic analyses of the causes of maternal mortality, hypertensive disorders are among the three leading direct causes of maternal death in Southeast Asia, alongside obstetric hemorrhage and sepsis. Data from the Ministry of Health of the Republic of Indonesia also confirm that preeclampsia and eclampsia account for a significant proportion of the national Maternal Mortality Ratio (MMR), particularly in areas where access to emergency obstetric care remains limited. This situation is further exacerbated by the dual epidemiological transition currently experienced by Indonesia, in which the increasing prevalence of non-communicable diseases, such as chronic hypertension, obesity, and type 2 Diabetes Mellitus among women of reproductive age, has contributed to a shift in the population-level risk profile of pregnancy. This phenomenon is consistent with projections indicating that the burden of HDP in developing countries is no longer driven solely by classical obstetric factors, such as extreme maternal age and nulliparity, but is increasingly influenced by pre-existing metabolic comorbidities.

On the other hand, Indonesia's tiered referral system, which positions regional general hospitals (RSUDs) as secondary referral centers within a network of community health centers (Puskesmas) and independent midwifery practices, creates a pattern in which cases tend to become concentrated and more severe at facilities such as Prof. Dr. Soekandar Regional General Hospital. This pattern further emphasizes the urgency of research based on local data, given that effective HDP screening and management strategies cannot be fully extrapolated from epidemiological data in developed countries, where population structures, dietary patterns, and access to primary healthcare services differ substantially. Granular mapping of case characteristics at regional referral hospitals, as conducted in this study, is therefore crucial for developing screening and prophylactic intervention protocols that are specifically relevant to the local epidemiological context, particularly in anticipating the interaction between HDP and metabolic comorbidities that are increasingly common among pregnant women in urban and semi-urban areas of East Java. Furthermore, limited laboratory capacity and shortages of trained healthcare personnel in some primary healthcare facilities

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may affect the consistency of early detection of glycemic disorders during pregnancy. Consequently, some cases of gestational or pre-existing diabetes may only be identified after patients are referred with more advanced HDP. Another epidemiological aspect relevant to the East Java context is the relatively high prevalence of marriage and repeated pregnancies among women of reproductive age within relatively close intervals. This sociodemographic pattern contributes to an increased population of multigravida women at risk, particularly those with relatively short interpregnancy intervals. Combined with local dietary patterns that are often high in sodium and simple carbohydrates, as well as the still-limited coverage of structured preconception screening in some primary healthcare facilities, these conditions cumulatively create a distinctive metabolic-obstetric risk landscape that requires continuous monitoring and mapping. Such efforts should extend beyond a single cross-sectional study, such as the present research.

II. Literature Review and Hypothesis Development

The relationship between Diabetes Mellitus (DM) and the increased risk of Hypertensive Disorders in Pregnancy (HDP), particularly preeclampsia, is not merely a statistical coincidence but is rooted in a complex and mutually reinforcing pathophysiological interplay. Pregnancy itself is physiologically a diabetogenic state. Beginning in the second trimester, hormones produced by the placenta, including human placental lactogen (hPL), cortisol, estrogen, and progesterone, progressively increase insulin resistance in maternal tissues. This represents an evolutionary physiological mechanism that ensures a continuous supply of glucose across the placenta to the rapidly growing fetus. In healthy pregnant women, the pancreas compensates by increasing insulin secretion by approximately two- to threefold. However, in women with limited pancreatic reserve, obesity, or chronic DM, this compensatory response may be insufficient, resulting in hyperglycemia and the development of gestational diabetes or worsening pre-existing DM. The effects of chronic hyperglycemia on vascular integrity are substantial. Elevated blood glucose levels promote the formation of Advanced Glycation End Products (AGEs). These AGEs bind to their receptors, known as Receptor for Advanced Glycation End Products (RAGE), on the surface of endothelial cells, thereby activating intracellular inflammatory signaling pathways and generating Reactive Oxygen Species (ROS). Excessive oxidative stress reduces the bioavailability of Nitric Oxide (NO), a major endogenous vasodilator. Reduced NO availability impairs vascular relaxation and promotes increased vascular stiffness, reactivity, and vasoconstriction, thereby contributing to the development of hypertension.

Furthermore, secondary hyperinsulinemia resulting from insulin resistance may directly contribute to elevated blood pressure. Excess insulin can stimulate sodium reabsorption in the renal tubules, leading to fluid retention and increased intravascular volume. In addition, insulin can activate the sympathetic nervous system, thereby increasing peripheral vascular resistance. The combination of AGE-mediated endothelial dysfunction, oxidative stress, increased release of anti-angiogenic factors from the ischemic placenta, such as soluble fms-like tyrosine kinase-1 (sFlt-1), hyperinsulinemia, and sympathetic overactivity may create a pathophysiological “perfect storm” that accelerates the progression from diabetes-associated hypertensive disorders in pregnancy to severe preeclampsia. Collectively, glucotoxicity, hyperinsulinemia, AGE-mediated endothelial dysfunction, and increased sFlt-1 release from the ischemic placenta provide a plausible biological mechanism linking metabolic dysfunction with the progression of HDP. These interconnected mechanisms may contribute to the transition from less severe hypertensive conditions during pregnancy to severe preeclampsia, particularly among pregnant women with Diabetes Mellitus.

III. Research Method

This study employed a descriptive observational research design using a purely retrospective approach. An observational design was selected to describe the clinical phenomena as they occurred in real-world settings without introducing any intervention, while the retrospective approach enabled the researchers to examine patients' historical medical records. The study was conducted at Prof. Dr. Soekandar

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Regional General Hospital, a regional public hospital in Mojokerto Regency, East Java, which serves as a referral hospital for patients referred from various Primary Healthcare Facilities (Fasilitas Kesehatan Tingkat Pertama, FKTP), including community health centers (Puskesmas), maternity clinics, and private medical practices. The target population comprised all pregnant women, regardless of gestational age, who underwent antenatal examinations or were hospitalized in the Department of Obstetrics and Gynecology at Prof. Dr. Soekandar Regional General Hospital during the six-month study period, from January 1 to June 30, 2026. The sampling method used was total sampling (census sampling), in which all population members who met the inclusion criteria were included as study subjects without randomization. The inclusion criteria were: (1) pregnant women with complete medical records; and (2) patients diagnosed by the attending physician (Dokter Penanggung Jawab Pelayanan, DPJP) with any form of Hypertensive Disorders in Pregnancy (HDP), including gestational hypertension, preeclampsia, eclampsia, or superimposed preeclampsia. The exclusion criteria included patients with missing or illegible medical records and patients who underwent referral deliveries without clearly documented blood pressure measurements or a documented history of blood pressure. The study used secondary data obtained from patients' medical records. The extracted variables included maternal age at the time of the visit or delivery; gravida/parity status, categorized as primigravida for first pregnancies and multigravida for second or subsequent pregnancies; preconception or first-trimester Body Mass Index (BMI) to define obesity (BMI >30 kg/m^2); and the presence of comorbid conditions, specifically Diabetes Mellitus, including both pre-existing and gestational diabetes. Data were analyzed using simple univariate statistical methods by calculating frequencies (n) and percentages (%). The data were presented in tables and graphs using standard statistical software to facilitate interpretation.

IV. Results and Discussion

A comprehensive review of medical records identified a total of 760 registered visits by pregnant women at the hospital during the first half of 2026, from January to June. Of these visits, 191 pregnant women were diagnosed with Hypertensive Disorders in Pregnancy (HDP). Based on these data, the institutional prevalence of HDP at Prof. Dr. Soekandar Regional General Hospital was 25.13%.

4.1. Monthly Distribution of Cases

The monthly distribution of cases showed a certain degree of fluctuation. The lowest absolute number of HDP cases was recorded in March, with 25 cases, representing 17.61% of the total pregnant women visiting the hospital that month. In contrast, the highest number of cases was observed in May, with 37 cases, corresponding to 30.83% of the total pregnant women recorded during that month.

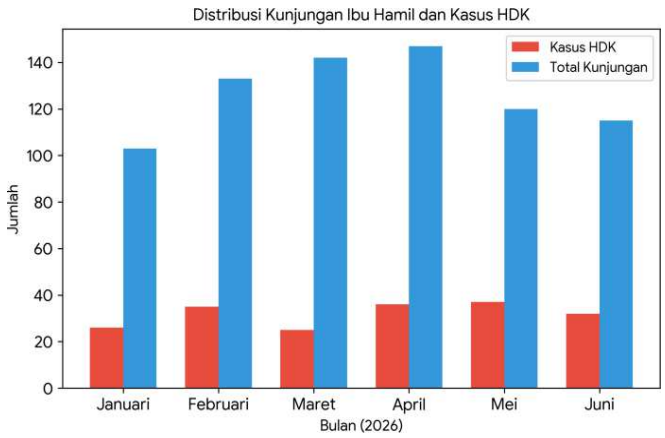

Figure 1. Distribution of Pregnant Women's Visits and the Proportion of HDP Cases by Month at Prof. Dr. Soekandar Regional General Hospital, January–June 2026

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Table 1. Detailed Distribution of HDP Incidence

Month (2026)	HDP Cases	Total Pregnant Women's Visits	Prevalence (%)
January	26	103	25.24
February	35	133	26.32
March	25	142	17.61
April	36	147	24.49
May	37	120	30.83
June	32	115	27.83
Overall Total	191	760	25.13

4.2. Demographic and Obstetric Characteristics

Based on age group classification, the data challenge the traditional view that Hypertensive Disorders in Pregnancy (HDP) are predominantly associated with extreme maternal age, particularly adolescence. Women aged <20 years accounted for only 20 cases (10.5%). The largest proportion of patients unexpectedly came from the ideal reproductive age group of 20–34 years, comprising 99 cases (51.8%). However, the high-risk age group of ≥35 years also accounted for a substantial proportion, with 72 cases (37.7%).

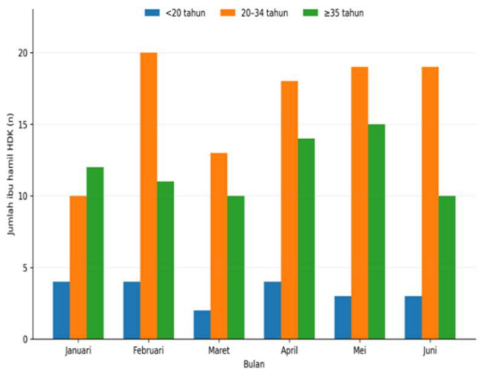

Figure 2. Distribution of Pregnant Women with HDP by Age Group and Month at Prof. Dr. Soekandar Regional General Hospital, January–June 2026

An examination of the patients' parity records revealed a deviation from the traditional paradigm that often characterizes preeclampsia as a “disease of first pregnancy.” Primigravida patients, defined as women experiencing their first pregnancy, accounted for 65 cases (34.0%). In contrast, multigravida patients predominated considerably, comprising 126 cases, or 66.0% of all HDP cases identified in this study.

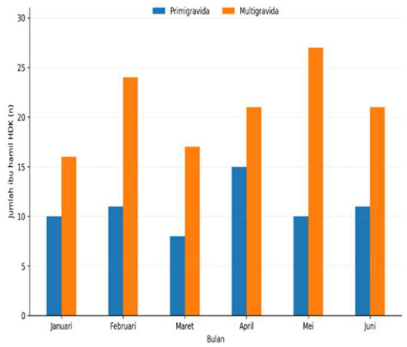

Figure 3. Distribution of Pregnant Women with HDP by Parity and Month at Prof. Dr. Soekandar Regional General Hospital, January–June 2026

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4.3. Obesity Status and Analysis of Diabetes Mellitus Comorbidity

The evaluation of metabolic risk parameters confirmed the important role of obesity. Among the 191 patients with Hypertensive Disorders in Pregnancy (HDP), more than half, namely 116 cases (60.7%), were identified as obese based on a preconception or early-pregnancy Body Mass Index (BMI) above the obesity threshold. In comparison, 75 patients (39.3%) had BMI values below the obesity threshold.

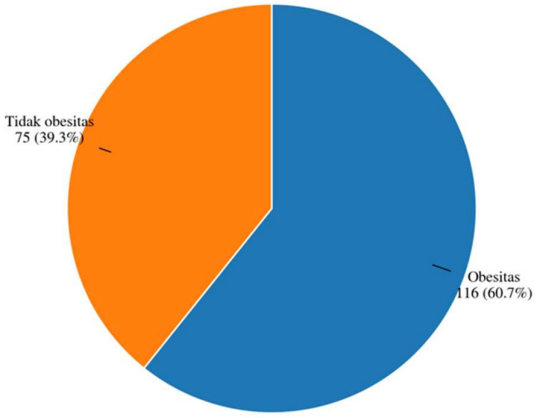

Figure 4. Distribution of Obesity Status among Pregnant Women with HDP at Prof. Dr. Soekandar Regional General Hospital, January–June 2026

A more specific analysis focused on the association between HDP and Diabetes Mellitus (DM) comorbidity. A careful review identified a subpopulation of 33 patients with HDP who had a pre-existing diagnosis of DM or were diagnosed during pregnancy. Among these 33 patients with both DM and HDP, a concerning pattern of clinical progression was observed: 25 patients (75.7% of the DM subgroup) progressed to preeclampsia, whereas only 8 patients (24.3%) remained within the HDP spectrum without preeclampsia complications, such as gestational hypertension or controlled chronic hypertension without proteinuria or organ dysfunction.

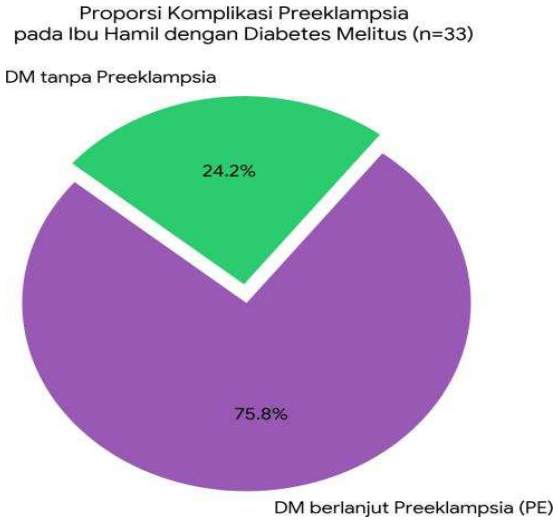

Figure 5. Proportion of Clinical Progression to Preeclampsia among Patients with HDP and Diabetes Mellitus Comorbidity (n = 33)

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4.4. High Institutional Prevalence

The HDP prevalence of 25.13% recorded at Prof. Dr. Soekandar Regional General Hospital was considerably higher than the estimated global prevalence of 5%–10% and reported national averages. However, this high proportion should not be interpreted as a direct indicator of deteriorating population health. Rather, it may reflect the hospital's role as a referral center within the tiered healthcare system, potentially resulting in referral bias. Primary healthcare facilities, including community health centers (Puskesmas) and other first-level healthcare facilities in Mojokerto Regency and surrounding areas, may have contributed effectively to early detection through blood pressure screening, resulting in the prompt referral of pregnant women suspected of having hypertensive complications to the regional hospital. The peak proportion observed in May (30.83%) indicates the need for more detailed temporal analysis to determine whether this pattern is associated with seasonal factors that may influence dietary habits or post-holiday fluctuations, which may be characterized by increased consumption of foods high in sodium and simple carbohydrates. However, such explanations remain speculative and would require further investigation using appropriate temporal and epidemiological data.

4.5. Age and Parity Patterns

The classical probability curve for HDP, particularly preeclampsia, is often described as U-shaped, with the highest risks observed at the extremes of maternal age, particularly among adolescents and women aged >35 years. However, the largest absolute number of patients in this study was found in the 20–34-year age group (51.8%). This finding may primarily reflect the demographic distribution of pregnancies, as the largest number of pregnancies generally occurs within this age range. Nevertheless, the substantial proportion of cases among women aged >35 years (37.7%) highlights the potential contribution of advanced maternal age to HDP risk. At advanced maternal age, age-related vascular changes may become more pronounced, including increased arterial stiffness, reduced endothelial regenerative capacity, and a higher prevalence of previously undiagnosed or subclinical chronic hypertension. These conditions may become clinically apparent when pregnancy imposes additional hemodynamic demands, including increases in cardiac output and blood volume. Another notable finding was the predominance of multigravida women, who accounted for 66.0% of HDP cases. Earlier literature emphasized the theory of immunological maladaptation, suggesting that primigravida women may be more susceptible to preeclampsia because of the first exposure of the maternal immune system to paternal and fetal antigens. The predominance of multigravida women in the present study may have several possible explanations. First, multigravidity is often associated with increasing maternal age, thereby incorporating age-related vascular risks. Second, repeated pregnancies, particularly when interpregnancy intervals are short, may contribute to cumulative metabolic burden. Multigravida women may also be more likely to accumulate weight across successive pregnancies through postpartum weight retention, potentially increasing their risk of obesity. Third, some multigravida women may have a history of preeclampsia or hypertension in previous pregnancies, which is an important predictor of recurrent HDP.

4.6. The Central Role of Metabolic Dysfunction: Obesity and Diabetes Mellitus

The finding that 60.7% of patients with Hypertensive Disorders in Pregnancy (HDP) were obese represents one of the key clinical findings of this study. The obesity epidemic has substantially reshaped the obstetric risk landscape. Obesity is no longer viewed merely as a passive reservoir of excess energy but rather as a highly active endocrine organ. Adipose tissue produces chronic pro-inflammatory cytokines, such as tumor necrosis factor-alpha (TNF-α) and interleukin-6 (IL-6), while dysregulating important adipokines by increasing leptin levels and reducing the protective adipokine adiponectin. This low-grade inflammatory state may precede pregnancy and create a compromised vascular milieu characterized by endothelial dysfunction

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even before placentation occurs. When trophoblastic invasion fails to adequately remodel the spiral arteries, an endothelium already compromised by obesity may be more vulnerable to the effects of elevated anti-angiogenic factors such as soluble fms-like tyrosine kinase-1 (sFlt-1). The most important focus of this analysis was the subgroup of 33 patients with HDP and Diabetes Mellitus (DM), among whom 25 patients (75.7%) progressed to preeclampsia. This high proportion may reflect the complex pathophysiological interaction between metabolic dysfunction and hypertensive complications during pregnancy. Diabetes Mellitus can contribute to vascular injury through hyperglycemia-induced diabetic vasculopathy.

Persistent hyperglycemia promotes oxidative stress and impairs nitric oxide bioavailability. When pregnancy further imposes an ischemic burden through placental dysfunction, maternal vascular adaptation may become increasingly impaired. In addition, insulin resistance and associated metabolic disturbances may promote renal sodium retention and alterations in uric acid metabolism. Hyperuricemia may further impair endothelial function and nitric oxide availability, potentially contributing to a vicious cycle of vascular dysfunction and hypertension. The interaction between HDP, particularly preeclampsia, obesity, and DM is sometimes described in the broader context of metabolic dysfunction or "diabesity" complicating pregnancy. Patients with DM may not develop preeclampsia from an entirely normal baseline. Instead, they may experience worsening of pre-existing chronic hypertension or manifestations of pre-existing renal microvascular damage, such as diabetic nephropathy, which may contribute to superimposed preeclampsia. This condition is associated with an increased risk of adverse maternal and fetal outcomes, including fetal growth restriction (FGR).

4.7. Comparison with Findings from Other Hospital-Based Studies in Indonesia

The HDP prevalence of 25.13% observed in this study, although relatively high, is broadly consistent with patterns reported by several hospital-based studies conducted in referral hospitals in Indonesia. Hospital-based populations may report substantially higher proportions than the general pregnant population because of referral patterns and differences in case severity. Retrospective studies conducted at several maternal and child hospitals in East Java have also reported high proportions of obesity among patients with preeclampsia, with many patients falling within the 20–35-year age range. This demographic pattern is broadly consistent with the findings of the present study. Such cross-institutional similarities suggest that the changing HDP risk profile in Indonesia, from the classical emphasis on primigravidity and younger maternal age toward a profile characterized by multigravidity and obesity, may reflect broader epidemiological changes rather than a purely local statistical anomaly.

Nevertheless, considerable variation in reported prevalence exists across different regions of Indonesia. Several regional studies have reported preeclampsia prevalence ranging from approximately 5% to more than 30%, depending on the referral level of the healthcare facility and the denominator used for calculation, such as total antenatal visits or total deliveries. These methodological differences highlight the need for caution when comparing prevalence estimates across studies and emphasize the importance of clearly defining the study population and denominator. The total sampling approach used in the present study ensured that all eligible cases within the defined study population were included, thereby minimizing sampling-related selection bias. A substantial distinction between the present study and many other hospital-based HDP studies in Indonesia is its specific examination of the Diabetes Mellitus comorbidity subgroup. Much of the existing national literature has focused on conventional risk factors, such as maternal age, parity, and family history of hypertension, without specifically examining the coexistence of HDP and dysglycemia. The finding that 75.7% of patients with HDP and DM progressed to preeclampsia is notable and is consistent with the broader evidence linking abnormal glucose metabolism with hypertensive complications during pregnancy. The Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study demonstrated a continuous association between maternal glucose levels and adverse pregnancy outcomes, including preeclampsia, across the range of maternal glucose concentrations studied. This evidence suggests that the contribution of

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metabolic dysfunction to pregnancy complications may exist along a continuum rather than being strictly binary, with important implications for risk assessment and metabolic screening during pregnancy.

4.8. Implications for Long-Term Maternal and Perinatal Outcomes

The clinical consequences of HDP and Diabetes Mellitus comorbidity extend beyond the peripartum period and may have important long-term implications for both maternal and child health. Women with a history of preeclampsia have an increased risk of subsequent cardiovascular disease, including chronic hypertension, ischemic heart disease, and stroke. Persistent or recurrent endothelial and metabolic dysfunction may contribute to this elevated long-term cardiovascular risk. When preeclampsia occurs concurrently with Diabetes Mellitus, as observed in 25 patients in the subgroup analyzed in this study, the long-term cardiovascular risk may be compounded because DM is itself an established cardiovascular risk factor. Therefore, women with both conditions may benefit from structured postpartum follow-up that includes periodic assessment of metabolic and cardiovascular risk factors rather than relying solely on routine postpartum care. From a fetal and neonatal perspective, the interaction between placental insufficiency associated with preeclampsia and the intrauterine hyperglycemic environment associated with maternal DM may produce complex and potentially contrasting perinatal outcomes. On the one hand, severe preeclampsia-associated placental insufficiency may increase the risk of fetal growth restriction (FGR) because of impaired oxygen and nutrient delivery. On the other hand, chronic maternal hyperglycemia may promote fetal overgrowth or macrosomia through compensatory fetal hyperinsulinemia. When these processes coexist within the same pregnancy, fetal growth may be difficult to predict without careful serial ultrasonographic monitoring. Newborns affected by either growth restriction or macrosomia may face increased risks of neonatal complications, including neonatal hypoglycemia, respiratory distress, and admission to a neonatal intensive care unit. Specific perinatal outcomes were not included among the variables analyzed in the present descriptive study. Therefore, these outcomes cannot be directly evaluated from the current dataset. Nevertheless, the potential interaction between maternal HDP, DM, placental dysfunction, and fetal growth represents an important area for future prospective cohort research at the same institution.

4.9. Research Limitations

Several methodological limitations should be considered when interpreting the findings of this study. First, the descriptive observational design used in this study was limited to describing the distribution and frequency of cases and did not allow for the assessment of causal relationships or statistical significance between variables. Although the 75.7% proportion of patients with Diabetes Mellitus (DM) who progressed to preeclampsia appeared descriptively high, this finding was not evaluated using bivariate or multivariate analyses, such as logistic regression with odds ratios and confidence intervals, which could simultaneously account for potential confounding variables, including age, parity, and obesity status. Therefore, this proportion should not be interpreted as evidence of a causal relationship between DM and progression to preeclampsia. Second, the use of secondary data obtained from medical records introduced the possibility of information bias. This included potential inconsistencies in the recording of preconception Body Mass Index (BMI) among healthcare providers and the possibility that DM diagnoses were not consistently confirmed using standardized oral glucose tolerance testing (OGTT) based on the latest diagnostic criteria. In addition, the final analysis did not explicitly distinguish between pre-existing diabetes and gestational diabetes mellitus, which may have limited the interpretation of the findings regarding the specific contribution of different types of DM to HDP and preeclampsia.

Third, this study was conducted at a single institution (single-center study) over a relatively short observation period of six months. Therefore, the generalizability of the findings to the broader population of pregnant women in Mojokerto, and particularly to the highly heterogeneous Indonesian population, should be considered with caution. The apparent monthly variation, including the peak number of cases observed in

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May, requires a longer observation period across multiple years to determine whether this pattern represents a systematic trend or merely short-term random fluctuation. Fourth, the study did not include definitive maternal and perinatal outcomes, such as the occurrence of eclampsia, HELLP syndrome, maternal death, Apgar scores, or the need for neonatal intensive care. Consequently, statements regarding poorer prognosis among patients with DM and preeclampsia presented in the discussion should be understood as theoretical inferences supported by the existing literature rather than direct empirical findings from the study cohort.

4.10. Recommendations for Future Research and Clinical Practice

In light of the limitations described above, further analytical research using a prospective cohort design, or at least a case-control design with multivariate analysis, is recommended to determine the strength of the association between Diabetes Mellitus and the progression of HDP to preeclampsia at Prof. Dr. Soekandar Regional General Hospital. Such studies should also incorporate appropriate adjustment for potential confounding factors to provide more reliable estimates of the independent contribution of DM to preeclampsia risk. Future research should ideally integrate maternal outcomes, including HELLP syndrome, acute kidney injury, and intensive care admission, as well as perinatal outcomes, including birth weight, Apgar scores, and the need for neonatal intensive care. This would provide a more comprehensive assessment of the clinical implications of HDP and its metabolic comorbidities. From a clinical practice perspective, the findings support the need to strengthen and standardize glycemic screening protocols among pregnant women diagnosed with HDP at Prof. Dr. Soekandar Regional General Hospital. Where clinically indicated and in accordance with applicable guidelines, standardized oral glucose tolerance testing at 24–28 weeks of gestation may be considered for patients without early risk factors, while earlier screening during the first trimester may be appropriate for women with risk factors such as obesity or a family history of DM. Standardized documentation of preconception BMI in electronic medical records is also recommended, given the high proportion of obesity observed in this study and the consistent evidence linking maternal obesity with adverse pregnancy outcomes.

At the referral-system level, strengthening blood pressure screening and early detection of metabolic disorders at community health centers (Puskesmas) and other primary healthcare facilities in Mojokerto Regency may facilitate earlier identification and management of women at high risk for HDP. Such an approach may help reduce the proportion of women presenting to the hospital with advanced preeclampsia and potentially lower the risk of severe maternal and fetal complications associated with delayed detection and intervention. Ultimately, the management of HDP with DM comorbidity at Prof. Dr. Soekandar Regional General Hospital and similar institutions in Indonesia requires a multidisciplinary approach involving obstetricians and gynecologists, internists or endocrinologists, clinical nutrition specialists, and public health professionals involved in preconception counseling and health education. An integrated care model of this kind may facilitate earlier identification and management of metabolic risk factors before the clinical manifestation of hypertension. It may also provide an opportunity to address interconnected pathways involving insulin resistance, metabolic dysfunction, endothelial dysfunction, and preeclampsia at an earlier stage. Although implementing such a collaborative model would require appropriate resource allocation and coordination of internal referral pathways, it is consistent with the high prevalence of obesity and the substantial proportion of DM comorbidity observed in this study. However, because the present study was descriptive in design, further analytical and prospective research is needed before metabolic comorbidities can be considered independent determinants of HDP severity in this population.

V. Conclusion

Based on a retrospective review of the medical records of 760 pregnant women's visits at Prof. Dr. Soekandar Regional General Hospital, Mojokerto Regency, during the first half of 2026 (January–June), this study concludes that the institutional burden of Hypertensive Disorders in Pregnancy (HDP) was relatively

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high, with a recorded proportion of 25.13% (191 cases). The study identified a risk profile that differed in some respects from the classical risk pattern. Most cases occurred among women of reproductive age (20–34 years), accounting for 51.8% of cases, followed by women aged >35 years, accounting for 37.7%. Multigravida women accounted for 66.0% of cases, while 60.7% of women with HDP were classified as obese, indicating a substantial burden of metabolic risk factors in the study population. A key finding of this study was the high proportion of patients with HDP and Diabetes Mellitus (DM) who progressed to preeclampsia. Among the 33 patients with HDP and DM, 75.7% were diagnosed with preeclampsia. This finding suggests that DM may coexist with and potentially contribute to greater clinical severity among pregnant women with HDP. Pathophysiological mechanisms involving hyperglycemia, insulin resistance, oxidative stress, and endothelial dysfunction may provide a biological basis for the observed pattern. However, because this study used a descriptive retrospective design without inferential statistical analysis, the observed proportion should not be interpreted as evidence of a causal relationship between DM and progression to preeclampsia. Clinical Implications: The findings of this study support the need to strengthen antenatal care (ANC) strategies across healthcare settings by incorporating more comprehensive assessment of metabolic risk factors. Antenatal surveillance should not focus exclusively on young primigravida women, but should also consider women with obesity, advanced maternal age, multigravida status, and DM or other metabolic risk factors. Early identification of metabolic abnormalities, including assessment of Body Mass Index (BMI) and appropriate glycemic screening, may facilitate timely risk stratification and management. For women at increased risk of preeclampsia, preventive interventions such as low-dose aspirin initiated before 16 weeks of gestation and appropriate glycemic management should be considered in accordance with current clinical guidelines and individual patient indications. Strengthening early detection, risk stratification, and multidisciplinary management may contribute to reducing the risk of severe maternal and perinatal complications associated with HDP.

References

American College of Obstetricians and Gynecologists. (2020). Gestational hypertension and preeclampsia: ACOG Practice Bulletin No. 222. Obstetrics & Gynecology, 135(6), e237–e260.

American Diabetes Association. (2024). Management of diabetes in pregnancy: Standards of care in diabetes—2024. Diabetes Care, 47(Supplement 1), S282–S294.

Bartsch, E., Medcalf, K. E., Park, A. L., Ray, J. G., & High Risk of Pre-eclampsia Clinical Indicators Group. (2016). Clinical risk factors for pre-eclampsia determined in early pregnancy: Systematic review and meta-analysis of large cohort studies. BMJ, 353, i1753.

Bellamy, L., Casas, J. P., Hingorani, A. D., & Williams, D. J. (2007). Pre-eclampsia and risk of cardiovascular disease and cancer in later life: Systematic review and meta-analysis. BMJ, 335(7627), 974.

Catalano, P. M. (2010). Obesity, insulin resistance, and pregnancy outcome. Reproduction, 140(3), 365–371.

Cunningham, F. G., Leveno, K. J., Bloom, S. L., Dashe, J. S., Hoffman, B. L., Casey, B. M., & Spong, C. Y. (2022). Williams obstetrics (26th ed.). McGraw Hill Education.

Duley, L. (2009). The global impact of pre-eclampsia and eclampsia. Seminars in Perinatology, 33(3), 130–137.

Huda, S. S., Freeman, D. J., & Nelson, S. M. (2009). Obesity in pregnancy. Clinical Reviews in Bone and Mineral Metabolism, 7(1), 58–69.

Kementerian Kesehatan Republik Indonesia. (2021). Profil kesehatan Indonesia tahun 2020. Kementerian Kesehatan Republik Indonesia.

Metzger, B. E., Lowe, L. P., Dyer, A. R., Trimble, E. R., Chaovarindr, U., Coustan, D. R., Hadden, D. R., McCance, D. R., Hod, M., McIntyre, H. D., Oats, J. J., Persson, B., Rogers, M. S., & Sacks, D. A. (2008). Hyperglycemia and adverse pregnancy outcomes. New England Journal of Medicine, 358(19), 1991–2002.

Poon, L. C., Shennan, A., Hyett, J. A., Kapur, A., Hadar, E., Divakar, H., McAuliffe, F., da Silva Costa, F., von Dadelszen, P., McIntyre, H. D., & Hod, M. (2019). The International Federation of Gynecology and Obstetrics (FIGO) initiative on pre-eclampsia: A pragmatic guide for first-trimester screening and prevention. International Journal of Gynecology & Obstetrics, 145(Supplement 1), 1–33.

ISSN [Online]: 2776-6381

Rana, S., Lemoine, E., Granger, J. P., & Karumanchi, S. A. (2019). Preeclampsia: Pathophysiology, challenges, and perspectives. Circulation Research, 124(7), 1094–1112.

Roberts, J. M., & Escudero, C. (2012). The placenta in preeclampsia. Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health, 2(2), 72–83.

Say, L., Chou, D., Gemmill, A., Tunçalp, Ö., Moller, A. B., Daniels, J., Gülmezoglu, A. M., Temmerman, M., & Alkema, L. (2014). Global causes of maternal death: A WHO systematic analysis. The Lancet Global Health, 2(6), e323–e333.

Sibai, B. M. (2002). Chronic hypertension in pregnancy. Obstetrics & Gynecology, 100(2), 369–377.

Steegers, E. A., von Dadelszen, P., Duvekot, J. J., & Pijnenborg, R. (2010). Pre-eclampsia. The Lancet, 376(9741), 631–644.

World Health Organization. (2011). WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia. World Health Organization.