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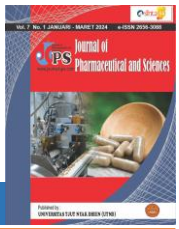

Association Between Length of Hospital Stay and Blood Pressure and Proteinuria Outcomes in Severe Preeclampsia

Hubungan Lama Perawatan dengan Outcome Tekanan Darah dan Proteinuria pada Preeklampsia Berat

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Abstract

Severe preeclampsia is a major obstetric complication associated with maternal and perinatal morbidity and mortality. Hospitalization duration may influence clinical outcomes, including blood pressure and proteinuria, particularly in patients receiving antihypertensive therapy with nifedipine or methyldopa.

This study aims to evaluate the association between the length of hospital stay and changes in systolic and diastolic blood pressure, as well as proteinuria, in patients with severe preeclampsia treated with nifedipine or methyldopa. This retrospective study reviewed medical records of patients diagnosed with severe preeclampsia and admitted to Dr. M. Djamil Central General Hospital, Padang, between January and December 2023. Patients were categorized into two groups based on hospitalization duration: <5 days and ≥5 days. All patients received monotherapy with either nifedipine or methyldopa. Data on patient demographics, clinical parameters, and hospitalization length were collected. Statistical analyses were performed using the independent t-test and the Mann–Whitney test, with a significance level of $p<0.05$. Of 60 patients included, 44 (73.3%) were hospitalized for ≥5 days, while 16 (26.7%) stayed <5 days. Patients with ≥5 days of hospitalization experienced a significantly greater reduction in systolic blood pressure (40.93 mmHg vs. 29.00 mmHg, $p=0.025$) and proteinuria (23.06 vs 33.20, $p=0.031$) compared to the <5-day group. No significant difference was observed in diastolic blood pressure reduction ($p=0.128$).

Keywords*: *Severe Preeclampsia, Hospital Stay, Blood Pressure, Proteinuria, Nifedipine, Methyldopa

Abstrak

Preeklampsia berat merupakan komplikasi obstetri utama yang berhubungan dengan morbiditas dan mortalitas maternal serta perinatal. Lama rawat inap dapat memengaruhi outcome klinis, termasuk tekanan darah dan proteinuria, terutama pada pasien yang menerima terapi antihipertensi dengan nifedipin atau metildopa. Penelitian ini bertujuan untuk menilai hubungan antara lama rawat inap dengan perubahan tekanan darah sistolik dan diastolik serta proteinuria pada pasien dengan preeklampsia berat yang menerima terapi nifedipin atau metildopa. Penelitian retrospektif ini dilakukan menggunakan rekam medis pasien yang didiagnosis preeklampsia berat dan dirawat di RSUP Dr. M. Djamil Padang, antara Januari hingga Desember 2023. Pasien dibagi menjadi dua kelompok berdasarkan lama rawat inap: <5 hari dan ≥5 hari. Semua pasien menerima monoterapi dengan nifedipin atau metildopa. Data demografi, parameter klinis, dan lama rawat inap dikumpulkan. Analisis statistik menggunakan uji t independen dan uji Mann–Whitney, dengan tingkat signifikansi $p<0,05$. Dari 60 pasien yang termasuk sampel, 44 pasien (73,3%) dirawat ≥5 hari, sedangkan 16 pasien (26,7%) <5 hari. Pasien dengan lama rawat inap ≥5 hari mengalami penurunan tekanan darah sistolik yang lebih besar secara signifikan (40,93 mmHg vs. 29,00 mmHg, $p=0,025$) dan proteinuria (23.06 vs 33.20, $p=0,031$) dibandingkan kelompok <5 hari. Tidak ditemukan perbedaan signifikan pada penurunan tekanan darah diastolik ($p=0,128$).

Kata Kunci*: *Preeklampsia Berat, Lama Rawat Inap, Tekanan Darah, Proteinuria, Nifedipin, Metildopa

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Introduction

Severe preeclampsia (PE) is a pregnancy-related hypertensive disorder that typically develops after 20 weeks of gestation, characterized by blood pressure levels of ≥160/110 mmHg accompanied by proteinuria exceeding 2 g per 24 hours [1]. This condition reflects endothelial dysfunction and systemic vasospasm, which may progress to multiorgan impairment [2]. If not managed promptly and appropriately, PE can substantially increase the risk of both maternal and perinatal morbidity and mortality [3]. Current management strategies for severe PE typically include the administration of antihypertensive therapy, close monitoring of blood pressure and proteinuria, and preparation for delivery should maternal or fetal conditions deteriorate [4]. The primary therapeutic objectives are to achieve blood pressure control, prevent seizures, minimize the risk of organ complications, and maintain maternal and fetal well-being until an optimal gestational age is reached or termination of pregnancy becomes medically indicated. Among the antihypertensive agents used, methyldopa and nifedipine remain the most frequently prescribed options, as they are considered effective and relatively safe during pregnancy [5].

The length of hospital stay plays a critical role in the management of severe PE, as it directly influences the intensity of clinical monitoring and the effectiveness of medical interventions. Beyond pharmacological efficacy, hospitalization duration may serve as an indicator of therapeutic outcomes [6]. Patients who demonstrate earlier improvements in blood pressure and proteinuria tend to require shorter hospital stays, which can reduce the risk of complications and the financial burden of care [7]. Conversely, inadequate hospitalization duration may restrict treatment effectiveness, increase the likelihood of fluctuating blood pressure and persistent proteinuria, and ultimately worsen maternal and neonatal outcomes. Sufficient hospitalization, therefore, is essential to optimize antihypertensive dose adjustments, enable regular laboratory assessments, and ensure continuous evaluation of clinical progress [8,9].

Despite its clinical importance, evidence linking hospitalization duration with improvements in clinical parameters among patients with severe PE remains scarce. This is particularly relevant when considering the use of commonly prescribed antihypertensive agents during pregnancy, such as methyldopa and nifedipine [10]. The paucity of data underscores the need for further investigation to determine whether significant differences exist in the relationship between length of hospital stay and improvements in systolic and diastolic blood pressure, as well as proteinuria, among patients with severe PE receiving either methyldopa or nifedipine therapy.

Methods

Study Design

This retrospective study was conducted at Dr. M. Djamil Central General Hospital, Padang, Indonesia. The research involved a review of medical records from patients diagnosed with severe preeclampsia who were admitted to the hospital's inpatient unit between January and December 2023.

Ethical Consideration

Ethical approval for this study was obtained from the Health Research Ethics Committee of Dr. M. Djamil Central General Hospital (Approval No. DP.04.03/D.XVI.XI/515/2024).

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Study Population and Sampling

The study population included pregnant women aged 18 years or older, with a gestational age of more than 20 weeks, who were hospitalized for at least 48 hours due to severe preeclampsia. A purposive sampling technique was applied to select patients who received monotherapy with either methyldopa or nifedipine and had complete medical records, including blood pressure measurements and proteinuria levels at both admission and discharge.

Data Collection

Data collected included patient characteristics, clinical parameters, and length of hospital stay. Patients were categorized into two groups based on hospitalization duration: less than 5 days and 5 days or more. The grouping was based on the Clinical Practice Guidelines for Severe Preeclampsia at Dr. M. Djamil Hospital, which recommend a minimum hospital stay of 5 days depending on the patient's clinical condition.

Data Analysis

Statistical analyses were performed to assess the association between length of hospital stay and clinical outcomes, including systolic and diastolic blood pressure as well as proteinuria. The Independent t-test was applied to normally distributed data, while the Mann–Whitney test was used for non-normally distributed data. Normality was tested before analysis. A p-value of less than 0.05 was considered statistically significant.

Results and Discussion

In this study, most patients (73.3%) were hospitalized for five days or more, while 26.7% stayed less than five days. Hospitalization duration was primarily determined by preeclampsia severity, comorbid conditions, therapeutic response, and clinical judgment [11]. The selection of the 5-day threshold was not solely based on the Clinical Practice Guidelines for Severe Preeclampsia at Dr. M. Djamil Hospital, which generally recommend a minimum hospitalization period of approximately five days to achieve clinical stabilization before discharge. It was also supported by empirical evidence. Several studies and administrative datasets have reported that the average or median length of stay among women with preeclampsia typically ranges between 4 and 6 days, indicating that a 5-day cut-off serves as a clinically meaningful midpoint within this distribution. Furthermore, previous research evaluating postpartum recovery and blood pressure normalization has utilized similar thresholds when exploring predictors of maternal outcomes, thereby reinforcing the appropriateness of using a 5-day criterion in the current analysis [12].

Table 1. Length of Hospital Stay Data for Patients with Severe Preeclampsia

Length of Stay (days)	Number of Patients	(%)
< 5	16	26.7
≥ 5	44	73.3

The most extended hospitalization occurred in a patient who presented with severe preeclampsia at 27–28 weeks of gestation with concurrent COVID-19 infection, requiring intensive monitoring. Most patients with stays of≥5 days underwent caesarean section (CS). Although uncomplicated CS patients can typically be discharged within 2–3 days, patients with preeclampsia or gestational hypertension require extended hospitalization to ensure stable blood pressure, monitored proteinuria, and overall maternal-fetal stability [13].

These findings align with previous studies indicating that severe preeclampsia often necessitates longer hospitalization than mild cases. An extended hospital stay is critical to reduce maternal complications, including eclampsia and renal failure, as well as perinatal risks such as fetal growth restriction and preterm birth. Therefore, the observed distribution of hospital stay has significant clinical implications for prognosis evaluation, antihypertensive therapy planning, and hospital resource management [14,15].

The analysis examining the association between length of hospital stay and clinical outcomes in patients with severe preeclampsia demonstrated significant improvements in several parameters. As shown in Table 2, patients who were hospitalized for ≥5 days experienced a greater reduction in systolic blood pressure (SBP) compared to those with <5 days of hospitalization (40.93 mmHg vs. 29.00 mmHg; p=0.025). A more extended hospitalization period allows for more consistent blood pressure monitoring, gradual titration of

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antihypertensive therapy, and timely evaluation of therapeutic response, thereby facilitating more stable hemodynamic control [16,17]. In severe preeclampsia, optimal blood pressure reduction often requires sustained intervention and observation rather than short-term stabilization alone. This is consistent with previous reports suggesting that blood pressure normalization in preeclamptic patients typically occurs over several days of inpatient management rather than within the first 24–48 hours [18]. Therefore, the observed greater decline in SBP among patients with longer hospital stays likely reflects the cumulative effect of extended monitoring, treatment adherence, and individualized clinical decision-making rather than the pharmacological properties of a specific antihypertensive agent [12,17].

Table 2. Comparison of Length of Hospital Stay with Systolic Blood Pressure Reduction

Length of Hospital Stay	Mean Systolic BP Reduction (mmHg)	p-value
< 5 days	29.00	0.025
≥ 5 days	40.93	

Table 3. Comparison of Length of Hospital Stay with Diastolic Blood Pressure Reduction

Length of Hospital Stay	Mean Diastolic BP Reduction (mmHg)	p-value
< 5 days	24.81	0.128
≥ 5 days	32.57	

Table 4. Comparison of Length of Hospital Stay with Proteinuria Reduction

Length of Hospital Stay	Mean Proteinuria Reduction	p-value
< 5 days	23.06	0.031
≥ 5 days	33.20	

In contrast (Table 3), diastolic blood pressure (DBP) did not differ significantly between patients hospitalized for <5 days and those hospitalized for ≥5 days (p=0.128). This may be explained by interindividual physiological variability, as DBP tends to decrease more slowly than SBP. Additionally, the pharmacological characteristics of the administered drugs influence these outcomes; methyldopa has a slower onset of action, and although nifedipine rapidly reduces SBP, its effect on DBP may not be proportional [5,19]. The non-normal distribution of the data could also hinder the detection of statistically significant differences. These findings align with Brown et al. (2018), who reported that DBP reduction in preeclampsia is often slower and less consistent compared to SBP, necessitating more intensive monitoring [20].

Analysis of proteinuria in Table 4 demonstrated that patients with a hospital stay of ≥5 days exhibited a greater reduction in proteinuria compared to those hospitalized for <5 days (p=0.031). Proteinuria in severe preeclampsia often reflects impaired renal function, which requires time for hemodynamic stabilization. A sufficiently extended hospital stay allows antihypertensive therapy and fluid management to take full effect, leading to improved proteinuria. Patients with more severe proteinuria or additional complications, renal impairment, or COVID-19 infection typically require extended hospitalization [21]. This observation is supported by Streegers et al. (2010), who reported that a reduction in proteinuria in severe preeclampsia may take several days to weeks, depending on the severity of the condition and response to therapy [22].

Furthermore, the type of medical intervention also influences the length of stay. Most patients hospitalized for ≥5 days underwent Caesarean section (CS), which generally requires more extended hospitalization compared to uncomplicated CS, particularly when preeclampsia or gestational hypertension necessitates closer monitoring. Differences in the onset and duration of action between methyldopa and nifedipine also affect clinical outcomes; methyldopa, with its slower onset, requires more extended hospitalization to achieve significant blood pressure reduction, whereas nifedipine acts more quickly but requires careful monitoring to maintain hemodynamic stability and achieve optimal proteinuria improvement [10, 17].

As a retrospective study, this research has several limitations that should be acknowledged. First, the relatively small sample size and the unequal distribution between treatment groups present essential constraints. Of the 60 patients included, 45 received methyldopa as monotherapy, whereas only 15 were treated with nifedipine. This imbalance may reduce the statistical power to compare the effects of the two

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drugs on blood pressure and proteinuria in patients with severe preeclampsia. Additionally, the retrospective design is vulnerable to selection bias and the possibility of incomplete or missing clinical data. Potential confounding variables, such as medication dosage, patient adherence, and specific comorbid conditions, could not be fully controlled, necessitating cautious interpretation of the findings.

Conclusions

A hospital stay of ≥5 days was associated with greater reductions in systolic blood pressure and proteinuria among patients with severe preeclampsia in this study. Nonetheless, these results should be interpreted cautiously due to the retrospective nature of the study, the imbalance in treatment group sizes, and the inability to control for confounding factors. Further prospective research with larger and more balanced samples is required to confirm these findings.

Conflict of Interest

The authors declare that there are no conflicts of interest related to this study.

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