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# Nifedipine Use Patterns in Preeclamptic Pregnant Women at Dr. Mohammad Hoesin Hospital

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## Abstract

Preeclampsia is a condition in pregnant women characterized by hypertension, defined as a systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg, along with proteinuria ≥ 300 mg. Nifedipine, a calcium channel blocker, is commonly used in the treatment of preeclampsia due to its rapid onset of action and lack of teratogenic effects. This study aims to determine the pattern of nifedipine use in pregnant women with preeclampsia at Mohammad Hoesin Hospital, Palembang. This drug utilization study was conducted using medical records of pregnant women diagnosed with preeclampsia at Mohammad Hoesin Hospital from June 1, 2020, to July 31, 2022. A total of 210 samples were obtained using total sampling. Data were collected based on inclusion criteria and analyzed using SPSS version 24.0 for Windows. Among the 210 patients with preeclampsia, the majority were diagnosed with severe preeclampsia (99%), aged over 35 years (54.3%), housewives (85.2%), multigravida (68.6%), multiparous (40.5%), and in the third trimester of pregnancy (95.2%). Nifedipine was administered at a dose of 10–20 mg (100%), with a frequency of ≤ 4 times per day (100%), and a duration of ≥ 1 day (100%). Most drug interactions observed were of the synergistic type (21%). One patient (0.5%) had a contraindication (mitral regurgitation) and did not meet the inclusion criteria. The pattern of nifedipine use in pregnant women with preeclampsia at Mohammad Hoesin Hospital was appropriate based on rational drug use criteria, including correct dosage (100%), frequency of administration (100%), duration of treatment (100%), and drug interaction profile (100%).

***Keywords:*** *Nifedipine, Calcium Channel Blocker, Preeclampsia, Drug Utilization Study*

## Abstrak

**Pola Penggunaan Nifedipin pada Ibu Hamil dengan Pre-eklampsia di RS Dr. Mohammad Hoesin Palembang.** Preeklampsia merupakan kondisi pada ibu hamil yang ditandai dengan hipertensi, yaitu tekanan darah sistolik ≥140 mmHg atau tekanan darah diastolik ≥90 mmHg, disertai proteinuria ≥300 mg. Nifedipin, yang termasuk dalam golongan *calcium channel blocker*, merupakan salah satu obat yang umum digunakan dalam penatalaksanaan preeklampsia karena memiliki onset kerja yang cepat serta tidak menimbulkan efek teratogenik. Penelitian ini bertujuan untuk mengetahui pola penggunaan nifedipin pada ibu hamil dengan preeklampsia di RSUP Dr. Mohammad Hoesin Palembang. Penelitian penggunaan obat ini dilakukan menggunakan data rekam medis ibu hamil yang didiagnosis preeklampsia di RSUP Dr. Mohammad Hoesin Palembang pada periode 1 Juni 2020 hingga 31 Juli 2022. Sebanyak 210 sampel diperoleh dengan metode *total sampling*. Data dikumpulkan berdasarkan kriteria inklusi dan dianalisis menggunakan perangkat lunak SPSS versi 24.0 untuk Windows. Dari 210 pasien dengan preeklampsia, sebagian besar didiagnosis mengalami preeklampsia berat (99%), berusia di atas 35 tahun (54,3%), berstatus ibu rumah tangga (85,2%), multigravida (68,6%), multipara (40,5%), dan berada pada trimester ketiga kehamilan (95,2%). Nifedipin diberikan dengan dosis 10–20 mg (100%), frekuensi pemberian ≤4 kali per hari (100%), dan lama pemberian ≥1 hari (100%). Sebagian besar interaksi obat yang ditemukan bersifat sinergis (21%). Terdapat satu pasien (0,5%) yang memiliki kontraindikasi berupa regurgitasi mitral sehingga tidak memenuhi kriteria inklusi penelitian. Pola penggunaan nifedipin pada ibu hamil dengan preeklampsia di RSUP Dr. Mohammad Hoesin Palembang telah sesuai dengan kriteria penggunaan obat yang rasional, meliputi ketepatan dosis (100%), ketepatan frekuensi pemberian (100%), ketepatan lama pemberian (100%), serta profil interaksi obat yang sesuai (100%).

***Kata Kunci:*** *Nifedipine, Penghambat Kanal Kalsium, Pre-eklampsia, Pola Penggunaan Obat*

## Introduction

Preeclampsia remains one of the leading causes of maternal and perinatal morbidity and mortality worldwide. Affecting approximately 2–8% of pregnancies, the disorder contributes substantially to adverse maternal and neonatal outcomes, particularly in low- and middle-income countries.[1-3] In Indonesia, preeclampsia accounts for approximately 24% of maternal deaths, highlighting its considerable public health burden.[3]

Preeclampsia is defined as new-onset hypertension after 20 weeks of gestation accompanied by proteinuria or evidence of maternal organ dysfunction.[4,5] Although its exact etiology remains incompletely understood, abnormal placentation, endothelial dysfunction, systemic inflammation, and oxidative stress are widely recognized as the principal mechanisms underlying disease development.[6-9] Consequently, the management of preeclampsia requires a comprehensive approach that includes early risk identification, blood pressure control, prevention of maternal complications, and timely delivery when clinically indicated.[1,5,7]

Control of severe hypertension is essential to reduce maternal morbidity and mortality. Current international guidelines recommend intravenous hydralazine, intravenous labetalol, and oral immediate-release nifedipine as first-line antihypertensive agents for the management of acute severe hypertension during pregnancy.[5,10,11] Nifedipine, a dihydropyridine calcium channel blocker, has become one of the preferred therapeutic options because of its rapid onset of action, favorable safety profile during pregnancy, and ease of oral administration.[12] Furthermore, a multicenter randomized controlled trial conducted by Easterling et al. demonstrated that oral nifedipine achieved blood pressure control at least as effectively as labetalol and methyldopa in women with severe hypertension during pregnancy.[13]

Previous studies have consistently demonstrated the effectiveness of nifedipine in lowering maternal blood pressure and improving pregnancy outcomes.[12-15] However, most published studies have primarily focused on clinical efficacy, comparative effectiveness, or maternal outcomes, whereas relatively few have evaluated drug utilization patterns in routine clinical practice.

Drug utilization studies provide important evidence regarding the rational use of medications in real-world healthcare settings. Evaluation of prescribing patterns—including dosage, frequency of administration, duration of therapy, contraindications, and potential drug interactions—is essential to determine whether antihypertensive therapy has been implemented according to current evidence-based recommendations.[16,17] Despite the widespread use of nifedipine for the management of preeclampsia, data describing its utilization pattern among pregnant women remain limited in Indonesia, particularly in tertiary referral hospitals.

Therefore, this study aimed to evaluate the pattern of nifedipine utilization among pregnant women with preeclampsia treated at Dr. Mohammad Hoesin General Hospital, Palembang. The findings are expected to provide real-world evidence regarding the rational use of nifedipine and contribute to optimizing antihypertensive therapy for pregnant women with preeclampsia.

## Materials and Methods

A retrospective descriptive drug utilization study was conducted using secondary data obtained from the medical records of pregnant women diagnosed with preeclampsia at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia. Dr. Mohammad Hoesin General Hospital is a tertiary referral hospital serving South Sumatra Province and surrounding regions. Medical records of patients treated between 1 June 2020 and 31 July 2022 were reviewed to evaluate the pattern of nifedipine utilization among pregnant women with preeclampsia.

### *Study population and sampling*

The study population consisted of all pregnant women diagnosed with preeclampsia who were hospitalized at Dr. Mohammad Hoesin General Hospital during the study period. The study sample included pregnant women with a confirmed diagnosis of preeclampsia who received nifedipine therapy and fulfilled the eligibility criteria. A total sampling technique was employed, in which all eligible medical records during the study period were included in the analysis.

### *Eligibility criteria*

Medical records were included if they contained complete clinical information and belonged to pregnant women diagnosed with preeclampsia who received nifedipine therapy. Records of patients diagnosed with preeclampsia complicated by HELLP syndrome were excluded from the study.

Secondary data were extracted from patients' medical records after permission had been obtained from the hospital Medical Record Unit. To ensure confidentiality, all patient identifiers were removed before data collection and analysis, and anonymized data were used throughout the study.

### *Data collection and analysis*

The variables collected included the type of preeclampsia, maternal age, occupation, gravida, parity, gestational age, nifedipine dosage, frequency of nifedipine administration, duration of therapy, potential drug interactions, and contraindications to nifedipine therapy. Drug interactions were classified as antagonistic, synergistic, or potentiating according to their pharmacological effects. Contraindications were evaluated based on the presence or absence of clinical conditions in which nifedipine administration should be avoided.

The primary outcome of this study was the pattern of nifedipine utilization among pregnant women with preeclampsia. Drug utilization was evaluated based on the appropriateness of nifedipine dosage, frequency of administration, duration of therapy, potential drug interactions, and contraindications. The prevalence of nifedipine use among pregnant women with preeclampsia during the study period was also determined. The appropriateness of nifedipine therapy was evaluated according to The American College of Obstetricians and Gynecologysts'guidelines, including indications, dosage, frequency of administration, duration of therapy, contraindications, and potential drug interactions.

The collected data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) version 24.0 for Windows. Univariate analysis was performed to summarize patient characteristics and patterns of nifedipine utilization.

## Results and Discussion

A total of 384 medical records of pregnant women diagnosed with preeclampsia during the study period (1 June 2020 to 31 July 2022) were reviewed. After applying the inclusion criteria, 210 eligible patients (54.6%) were included in the final analysis.

### *Patient characteristics according to demographic and the severity of preeclampsia*

A total of 210 pregnant women diagnosed with preeclampsia who met the eligibility criteria were included in this study. The majority of patients were diagnosed with severe preeclampsia (n = 208, 99.0%), whereas only two patients (1.0%) had preeclampsia without severe features (Table 1).

More than half of the patients were aged >35 years (n = 114, 54.3%), followed by those aged 20–35 years (n = 56, 26.7%) and <20 years (n = 40, 19.0%). Most patients were housewives (n = 179, 85.2%), while only 31 patients (14.8%) were employed.

Regarding obstetric characteristics, multigravida women accounted for the largest proportion of cases (n = 144, 68.6%), whereas primigravida women represented 31.4% (n = 66). Based on parity, multiparous women constituted the largest group (n = 85, 40.5%), followed by nulliparous (n = 67, 31.9%) and primiparous women (n = 58, 27.6%). Furthermore, the majority of patients were in the third trimester of pregnancy (n = 200, 95.2%), while only 10 patients (4.8%) were in the second trimester (Table 1).

**Table 1.** Characteristics of Pregnant Women with Preeclampsia (n = 210)

| Variable | Category | n | % |
|---|---|---|---|
| Severity of preeclampsia | Without severe features | 2 | 1.0 |
| | Severe features | 208 | 99.0 |
| Age (years) | <20 | 40 | 19 |
| | 20–35 | 56 | 26.7 |
| | >35 | 114 | 54.3 |
| Occupation | Employed | 31 | 14.8 |
| | Housewife | 179 | 85.2 |
| Gravidity | Primigravida | 66 | 31.4 |
| | Multigravida | 144 | 68.6 |
| Parity | Nullipara | 67 | 31.9 |
| | Primipara | 58 | 27.6 |
| | Multipara | 85 | 40.5 |
| Gestational age | Second trimester | 10 | 4.8 |
| | Third trimester | 200 | 95.2 |

## *Pattern of nifedipine utilization*

All patients received nifedipine at a dose of 10–20 mg, which was within the recommended therapeutic range for the management of hypertensive disorders during pregnancy. The prescribed dosing frequency did not exceed four administrations per day in any patient, and the duration of therapy was at least one day for all cases. Overall, nifedipine prescribing was fully consistent with the hospital's treatment protocol regarding dose, dosing frequency, and duration of therapy (Table 2).

**Table 2.** Pattern of nifedipine utilization

| Variable | Category | n | % |
|---|---|---|---|
| Dose | 10-20 mg | 210 | 100 |
| | 30-60 mg | 0 | 0 |
| Frequency (daily) | ≤ four times | 210 | 100 |
| | >4 times | 0 | 0 |
| Duration (days) | ≥ 1 day | 210 | 100 |
| | <1 day | 0 | 0 |

### *Drug interaction*

Potential drug interactions were identified in a proportion of patients receiving nifedipine. The majority of nifedipine interactions with other drugs were none (90%), synergistic (10%), and no clinically significant antagonistic interactions requiring therapeutic modification were identified (Table 3).

Synergistic drug interactions involving nifedipine were identified in 21 patients (10.0%). The combination of nifedipine and magnesium sulfate accounted for the majority of these interactions (16 patients, 7.6%), whereas concomitant administration of nifedipine and methyldopa was observed in five patients (2.4%) (Table 4). No antagonistic drug interactions involving nifedipine were identified during the study period.

**Table 3.** Drug Interaction

| Interaction | n | % |
|---|---|---|
| None | 189 | 0 |
| Synergistic | 21 | 10 |
| Antagonistic | 0 | 0 |
| Potentiation | 0 | 0 |

**Table 4.** Potential Synergistic Drug Interactions Observed During Nifedipine Therapy

| Concomitant medication | Type of interaction | n | % |
|---|---|---|---|
| Methyldopa | Synergistic | 5 | 2.4 |
| Magnesium sulfate | Synergistic | 16 | 7.6 |
| **Total** | | **21** | **10.0** |

Only one patient from all of the preeclampsia patients had a documented contraindication to nifedipine therapy due to mitral regurgitation. Consequently, this patient was excluded from the final analysis.

## Discussion

The present study demonstrated that preeclampsia with severe features was the predominant clinical presentation among pregnant women receiving nifedipine therapy, accounting for 99.0% of all cases. This finding indicates that most patients were admitted to Dr. Mohammad Hoesin General Hospital after the disease had progressed to a severe stage. As a tertiary referral hospital in South Sumatra, the institution primarily manages complicated pregnancies referred from secondary healthcare facilities, which may explain the remarkably high proportion of severe preeclampsia observed in this study.[18]

The predominance of severe preeclampsia observed in the present study is consistent with previous reports from Indonesia and other countries. Maisarah et al. reported that 80% of pregnant women with preeclampsia admitted to Abdul Wahab Sjahranie Regional Hospital presented with severe features, whereas Nurizawati et al. found that severe preeclampsia accounted for 72.97% of hospitalized cases at Yasri General Hospital.[18,19] Similar findings were reported by Ogunwole et al., who observed that more than half of women with preeclampsia treated at a tertiary referral center in the United States had severe disease.[20] The higher proportion observed in the present study is likely attributable to differences in referral systems, disease severity at presentation, and the role of Dr. Mohammad Hoesin General Hospital as the principal tertiary referral center in South Sumatra.

Delayed diagnosis and inadequate antenatal care may also contribute to the predominance of severe preeclampsia. Because early-stage preeclampsia is frequently asymptomatic, delayed recognition may allow progressive endothelial dysfunction and multisystem involvement before appropriate treatment is initiated.

Consequently, women with limited antenatal surveillance are more likely to present with advanced disease requiring hospitalization.[18,19] Early identification of women at risk and timely antihypertensive management remain essential to reduce maternal and fetal complications.[1,5]

Maternal age is one of the most consistently reported risk factors for preeclampsia. In the present study, more than half of the patients were older than 35 years, indicating that advanced maternal age was common among women requiring hospitalization. Increasing maternal age is associated with vascular remodeling, endothelial dysfunction, reduced arterial compliance, and a greater prevalence of chronic hypertension, diabetes mellitus, and obesity, all of which contribute to abnormal placentation and impaired uteroplacental perfusion.[7,9,21] These findings agree with previous epidemiological studies demonstrating that women of advanced maternal age have a significantly higher risk of developing hypertensive disorders during pregnancy.

Most participants in this study were housewives. Although occupation itself is not considered an independent predictor of preeclampsia, employment status may reflect socioeconomic conditions, educational background, access to healthcare services, and health-seeking behaviour. Women with limited access to antenatal care may experience delayed diagnosis and management, thereby increasing the likelihood of severe disease at hospital admission.[22]

Regarding obstetric characteristics, multigravida and multiparous women constituted the largest proportion of patients. Although nulliparity has traditionally been recognized as an important risk factor for preeclampsia, referral hospitals frequently receive women with previous obstetric complications, chronic hypertension, or recurrent preeclampsia, resulting in a greater proportion of multigravida women among hospitalized patients.[23,24] Therefore, the distribution observed in the present study probably reflects referral patterns rather than the true epidemiological profile of preeclampsia in the general obstetric population.

The majority of patients were diagnosed during the third trimester of pregnancy. This finding is consistent with the natural history of preeclampsia, which generally becomes clinically apparent after 20 weeks of gestation and progresses as placental ischemia induces systemic endothelial dysfunction, vasoconstriction, and hypertension.[6-8] Consequently, many women require hospitalization during late pregnancy when maternal and fetal complications become increasingly evident.

The present study demonstrated complete adherence to institutional prescribing practices regarding nifedipine dosage, frequency of administration, and treatment duration. All patients received 10–20 mg of nifedipine with a dosing frequency not exceeding four administrations per day, and therapy was continued for at least one day. These findings indicate excellent compliance with current recommendations for the pharmacological management of hypertensive disorders during pregnancy.[5,10,12]

Current international guidelines recommend immediate-release oral nifedipine as one of the first-line agents for the treatment of severe hypertension during pregnancy because of its rapid onset of action, favourable maternal safety profile, and effectiveness in achieving prompt blood pressure reduction.[5,10] Oral nifedipine generally begins to lower blood pressure within 20–30 minutes, making it particularly useful for emergency blood pressure control while avoiding excessive maternal hypotension.[12,25,26]

Our findings are consistent with previous Indonesian studies evaluating antihypertensive utilization among women with preeclampsia. Ristyaningsih et al. reported that nifedipine was the most frequently prescribed antihypertensive and demonstrated a high level of prescribing appropriateness according to rational drug use indicators.[14] Likewise, Andriana et al. found that more than 90% of antihypertensive prescriptions fulfilled the criteria for appropriate indication, drug selection, patient selection, and dosage.[15] These findings suggest that adherence to evidence-based prescribing recommendations has improved in Indonesian referral hospitals.

The observed prescribing pattern may also reflect increasing implementation of national and international clinical practice guidelines. Appropriate dosing and administration of antihypertensive therapy are essential to prevent maternal complications such as stroke, heart failure, renal injury, and placental hypoperfusion while minimizing adverse fetal outcomes.[5,10] Consequently, periodic drug utilization evaluations remain important for ensuring continued adherence to evidence-based recommendations and improving the quality of maternal healthcare.[16,17]

Potential drug interactions involving nifedipine were identified in 10.0% of patients, whereas no clinically relevant interactions were observed in the remaining 90.0%. Importantly, no antagonistic or potentiating interactions requiring therapeutic modification were identified. These findings indicate that nifedipine was generally prescribed safely and appropriately in hospitalized pregnant women with preeclampsia.

The most common synergistic interaction involved the combination of nifedipine and magnesium sulfate, accounting for 7.6% of all patients. Magnesium sulfate is routinely administered for seizure prophylaxis in women with severe preeclampsia and eclampsia, whereas nifedipine is prescribed for rapid blood pressure reduction.[5,27] Although both agents may produce additive vasodilatory effects, previous studies have demonstrated that their concomitant administration is generally safe when maternal blood pressure and neuromuscular status are carefully monitored.[27,28]

A smaller proportion of patients received concomitant methyldopa and nifedipine therapy. This combination may provide complementary antihypertensive effects because methyldopa acts centrally through $\alpha_2$-adrenergic receptor stimulation, whereas nifedipine reduces peripheral vascular resistance by inhibiting calcium influx into vascular smooth muscle.[25,29] The pharmacodynamic synergy between these agents may improve blood pressure control without substantially increasing maternal adverse effects when appropriately monitored.[30,31,32]

Only one patient presented with mitral regurgitation, representing a documented contraindication requiring careful consideration before nifedipine administration. Because this patient did not fulfill the predefined eligibility criteria, the case was excluded from the final analysis. Although significant valvular heart disease is not an absolute contraindication in every circumstance, individualized cardiovascular assessment remains necessary before initiating antihypertensive therapy in pregnant women with structural heart disease.[33,34]

Overall, the low frequency of clinically relevant drug interactions and the absence of inappropriate prescribing support the rational utilization of nifedipine in this tertiary referral hospital. Continuous pharmacovigilance and periodic drug utilization evaluation remain essential to maintain prescribing quality and patient safety, particularly in high-risk obstetric populations.[16,17]

## Conclusions

The present study demonstrated that nifedipine prescribing for pregnant women with preeclampsia at Dr. Mohammad Hoesin General Hospital was consistent with evidence-based recommendations regarding dosage, frequency of administration, treatment duration, contraindications, and clinically relevant drug interactions. Although most patients presented with preeclampsia with severe features, nifedipine remained an appropriate first-line antihypertensive agent and was prescribed rationally throughout the study period.

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