



# The Role of Primary Health Care in Early Detection of Preeclampsia: A Case Series from a Community Health Center

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## ABSTRACT

**Introduction:** Preeclampsia remains a leading cause of maternal and perinatal morbidity and mortality in Indonesia. Early detection at the primary health care (PHC) level is critical yet often hampered by incomplete risk assessment. This study evaluates the clinical application of the Maternal and Child Health Book (Buku KIA), Poedji Rochjati Score Card (KSPR), Mean Arterial Pressure (MAP), and Roll-Over Test (ROT) for early preeclampsia screening at a community health center.

**Case Illustration:** Three pregnant women at Puskesmas Tambakrejo, Surabaya, are described. Case 1 (38 years, G3P2A0, 20 weeks) had gestational hypertension with a KSPR score of 6 (high-risk), prompting Methyldopa and calcium prophylaxis followed by planned referral. Case 2 (22 years, G1P0A0, 29 weeks) presented with asymptomatic severe preeclampsia (BP 173/121 mmHg, proteinuria 1+, KSPR 12), requiring immediate emergency transfer. Case 3 (28 years, G3P1A1, 4-5 weeks) had chronic hypertension, prior preterm preeclampsia, positive

MAP/ROT, and KSPR 12, leading to immediate Amlodipine and tertiary referral.

**Discussion:** Standardized KSPR scoring successfully stratified patients into clear risk categories. MAP and ROT detected subclinical vascular dysfunction, particularly in early gestation. While management aligned with national (POGI) and international (ACOG/WHO) guidelines, gaps persisted in dipstick-only proteinuria assessment, incomplete documentation, and inconsistent prophylactic agent availability.

**Conclusion:** Integrated Maternal and Child Health Book, KSPR, MAP, and ROT screening at the PHC level enables early preeclampsia detection, timely stabilization, and structured referrals. Digitalization, supply chain strengthening, and provider training are recommended to reduce maternal mortality.

**Keywords:** Preeclampsia, Primary Health Care, Maternal and Child Health Book, Poedji Rochjati Score Card, Early Detection.

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## INTRODUCTION

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Preeclampsia is a complex, multi-system disorder that complicates approximately 5% to 8% of all pregnancies globally.<sup>1</sup> In low- and middle-income countries (LMICs), it constitutes a major public health challenge, driving high rates of maternal and perinatal mortality.<sup>1</sup> In Indonesia, the national maternal mortality rate (MMR) remains high, with hypertensive disorders of pregnancy (HDP) accounting for approximately 33.07% of these deaths.<sup>3</sup> The pathophysiology of preeclampsia is rooted in defective trophoblastic invasion of the uterine spiral arteries during early gestation.<sup>1</sup> This failure of physiological remodeling prevents the transformation of high-resistance, low-flow vessels into low-resistance, high-flow systems, culminating in placental ischemia, systemic endothelial dysfunction, and widespread vasospasm.<sup>1</sup>

To mitigate this burden, the Ministry of Health of the Republic of Indonesia has prioritized early detection within primary health care (PHC) facilities, locally known as Puskesmas.<sup>4</sup> Antenatal care (ANC) guidelines mandate at least six visits, with a minimum of two examinations conducted by a physician in the first and third trimesters to screen for obstetric risks.<sup>8</sup> The primary tool for documenting and monitoring these risks is the standardized "pink" Maternal and Child Health Book (Buku KIA).<sup>10</sup> Within this system, clinicians utilize clinical screening algorithms, including the Poedji Rochjati Score Card (KSPR), Mean Arterial Pressure (MAP), and the Roll-Over Test (ROT).<sup>3</sup>

The KSPR is a validated, cumulative risk-scoring tool that classifies pregnant women into Low-Risk Pregnancy (KRR, score 2), High-Risk Pregnancy (KRT, score 6-10), and Very High-Risk Pregnancy (KRST, score  $\geq 12$ ) groups.<sup>14</sup> Meanwhile, MAP and ROT serve as simple, cost-effective physiological markers of early vascular hyper-reactivity and subclinical endothelial dysfunction.<sup>3</sup> While international bodies such as the American College of Obstetricians and Gynecologists (ACOG) and the World Health Organization (WHO) advocate for a risk-factor-based screening approach to guide aspirin and calcium prophylaxis, Indonesian primary health clinics rely heavily on the combination of these physical and clinical screening markers.<sup>17</sup>

Despite the established clinical guidelines, a significant gap remains in the consistent implementation and documentation of these screening protocols at the primary care level.<sup>7</sup> High patient volumes, administrative burdens, and varying clinical expertise among community midwives and general practitioners often lead to incomplete risk assessments.<sup>7</sup> Consequently, many high-risk patients are either under-diagnosed or referred late, when severe complications such as eclampsia, HELLP syndrome, or fetal growth restriction have already developed.<sup>1</sup>

This study evaluates the role of Puskesmas Tambakrejo, Surabaya, in early preeclampsia screening using these integrated parameters and assess clinical and referral outcomes in a community-based setting. By comparing local clinical workflows against national (POGI) and international (ACOG/WHO) guidelines, this report highlights the strengths and gaps in the primary healthcare screening framework. It is hypothesized that the systematic, objective application of Buku KIA, KSPR, MAP, and ROT screening at the primary care level allows for the precise stratification of preeclampsia risk across different gestational ages. This stratification, in turn, facilitates early prophylactic interventions, blood pressure control, and organized referrals to secondary or tertiary facilities.

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### CASE SERIES

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This case series presents three pregnant patients managed at Puskesmas Tambakrejo, Surabaya, East Java, between 2025 and 2026. The demographic, clinical, and laboratory profiles of these patients are structured in the tables below.

**Table 1: Baseline Demographics and Obstetric History of the Patients**

| Parameter                    | Case 1: .Mrs.K | Case 2: Mrs. VA | Case 3: Yuniar Farah |
|------------------------------|----------------|-----------------|----------------------|
| Age (Years)                  | 38             | 22              | 28                   |
| Obstetric Status             | G3P2A0         | G1P0A0          | G3P1A1               |
| Gestational Age at Diagnosis | 20 Weeks       | 29/30 Weeks     | 4–5 Weeks            |
| First Day of Last            | Jan 1, 2026    | Oct 17, 2025    | Apr 18, 2026         |

|                                        |              |                       |                                                                |
|----------------------------------------|--------------|-----------------------|----------------------------------------------------------------|
| <b>Menses (HPHT)</b>                   |              |                       |                                                                |
| <b>Estimated Date of Delivery (TP)</b> | Oct 8, 2026  | Jul 24, 2026          | Jan 25, 2027                                                   |
| <b>Prior Obstetric Complications</b>   | None         | None (Primigravida)   | Severe preeclampsia and premature birth (SC at 34 weeks, 00 g) |
| <b>Chronic Comorbidities</b>           | None         | Chronic Hypertension  | Chronic Hypertension                                           |
| <b>Family History</b>                  | None         | Hypertension (Father) | Hypertension (Mother)                                          |
| <b>Occupation</b>                      | Gojek Driver | Private Sector        | Entrepreneur                                                   |

**Table 2: Clinical Parameters and Preeclampsia Screening Metrics at Presentation**

| <b>Parameter</b>                         | <b>Case 1: .Mrs.K</b>   | <b>Case 2: Mrs. VA</b>      | <b>Case 3: Yuniar Farah</b> |
|------------------------------------------|-------------------------|-----------------------------|-----------------------------|
| <b>Initial Blood Pressure (mmHg)</b>     | 151/95 (Repeat: 121/74) | 173/121 (MCH Book: 175/121) | 181/120 (Repeat: 180/110)   |
| <b>Heart Rate (bpm)</b>                  | 80                      | 80                          | 80                          |
| <b>Respiratory Rate (rpm)</b>            | 20                      | 20                          | 20                          |
| <b>Weight (kg) / Height (cm)</b>         | 75 / 150                | 99 / 160                    | 90 / 170                    |
| <b>Calculated BMI (kg/m<sup>2</sup>)</b> | 33.33 (Obesity Class I) | 38.67 (Obesity Class II)    | 31.14 (Obesity Class I)     |
| <b>LILA (cm)</b>                         | 34                      | 39                          | 35                          |
| <b>Mean Arterial</b>                     | Borderline              | Not Performed               | Positive                    |

|                             |                                 |                              |                               |
|-----------------------------|---------------------------------|------------------------------|-------------------------------|
| <b>Pressure (MAP)</b>       |                                 | (Severe HTN)                 |                               |
| <b>Roll-Over Test (ROT)</b> | Not Performed (Early Gestation) | Not Performed (Severe HTN)   | Positive                      |
| <b>KSPR Score</b>           | 6 (High-Risk Category)          | 12 (Very High-Risk Category) | 12 (Very High-Risk Category)  |
| <b>Chief Complaint</b>      | None                            | General Assessment           | Severe Dizziness and Headache |

**Table 3: Laboratory Profiles at Primary Care Assessment**

| <b>Laboratory Parameter</b>                      | <b>Case 1: .Mrs.K</b> | <b>Case 2: Mrs. VA</b> | <b>Case 3: Yuniar Farah</b> |
|--------------------------------------------------|-----------------------|------------------------|-----------------------------|
| <b>Hemoglobin (g/dL)</b>                         | 12.9 (Initial: 12.0)  | 11.5                   | 12.4                        |
| <b>Leukocyte Count (/uL)</b>                     | 10,280                | Not Performed          | 7,400 (Historical)          |
| <b>Platelet Count (/uL)</b>                      | 443,000               | Not Performed          | 350,000 (Historical)        |
| <b>Red Blood Cell Count (x10<sup>6</sup>/uL)</b> | 4.36                  | Not Performed          | 5.03                        |
| <b>RBC Indices (MCV / MCH)</b>                   | 89.6 fL / 29.6 pg     | Not Performed          | 83.2 fL / 24.6 pg           |
| <b>Urine Protein (Dipstick)</b>                  | Negative              | Positive 1+ (+1)       | Negative                    |
| <b>Random Blood Glucose (mg/dL)</b>              | 106                   | Not Performed          | 107                         |
| <b>Triple Elimination (HIV/HBsAg/Syphilis)</b>   | Non-Reactive          | Non-Reactive           | Non-Reactive                |
| <b>Blood Type / Rhesus</b>                       | B / Positive          | B / Positive           | B / Positive                |

### **Case 1: Gestational Hypertension with High Risk Stratification**

Mrs.K, a 38-year-old multigravida (G3P2A0), presented for her first antenatal care visit at Puskesmas Tambakrejo at 16/17 weeks of gestation. Anamnesis revealed that she worked as a motorcycle-taxi (Gojek) driver, exposing her to daily physical fatigue. Her first two pregnancies, 15 and 10 years prior, resulted in uncomplicated, spontaneous, term deliveries of healthy infants weighing 3.5 kg and 3.2 kg, respectively. She reported no personal history of chronic hypertension, diabetes mellitus, or preeclampsia, and her family medical history was unremarkable. However, her demographic risk profile was highly notable for advanced maternal age (38 years old) and a prolonged interpregnancy interval of 10 years, which are recognized as moderate-risk factors for the development of preeclampsia.<sup>10</sup>

On physical examination, her initial blood pressure was elevated at 151/95 mmHg, which decreased to 121/74 mmHg after a period of rest in a quiet room. Her height was 150 cm, and her body weight was 75 kg, yielding a body mass index (BMI) of 33.33 kg/m<sup>2</sup>, indicative of Class I obesity. Her upper arm circumference (LILA) was 34 cm, reflecting adequate nutritional reserves. Fundal height (TFU) was palpated at 13 cm, consistent with her gestational age, and the fetal heart rate (FHR) was stable and active at 145 beats per minute.

Laboratory investigations performed at the primary clinic revealed a hemoglobin level of 12.9 g/dL, a leukocyte count of 10,280/uL, and a platelet count of 443,000/uL. Complete urinalysis demonstrated negative urine protein and glucose. Her blood type was B Rhesus-positive, and triple elimination screening for HIV, Hepatitis B (HBsAg), and Syphilis was non-reactive.

Using the KSPR, her risk score was calculated as 6 (base score of 2, plus 4 points for advanced maternal age and the >10-year birth interval), placing her in the High-Risk Pregnancy (KRT) category.<sup>14</sup> Based on the initial transient systolic and diastolic hypertension, she was clinically diagnosed with gestational hypertension (ICD-10: Z35.9, Supervision of high-risk pregnancy, unspecified). The primary care physician initiated pharmacological prophylaxis with oral Calcium Lactate 500 mg daily and a combined iron-folic acid tablet (Ferrous Sulfate 200 mg / Folic Acid 0.25 mg) daily. For blood pressure management, a short course of oral Methyldopa 250

mg twice daily was prescribed.

On her second visit at 21 weeks of gestation, her blood pressure had stabilized to 138/80 mmHg, and her body weight increased slightly to 76.2 kg. Fundal height was appropriate, and FHR was normal at 136 beats per minute. She continued her calcium and Methyldopa regimen. At her third visit on May 25, 2026, at 20 weeks of gestation (adjusted by late ultrasound dating), her blood pressure remained controlled at 130/80 mmHg, and her body weight was 77 kg. However, given her cumulative risk factors (advanced maternal age, prolonged interpregnancy interval, Class I obesity) and history of transient early-pregnancy hypertension, her diagnosis was updated to O14.9 (Unspecified pre-eclampsia/gestational hypertension). To ensure safety, she was referred to the Obstetrics and Gynecology department at RS DKT (Rumkitban Surabaya) for specialized maternal-fetal surveillance.

### **Case 2: De Novo Severe Preeclampsia at late Second Trimester**

Mrs. VA, a-year-old primigravida (G1P0A0), presented to the maternal clinic of Puskesmas Tambakrejo on May 11, 2026, at 29 weeks of gestation for a routine prenatal check-up. She was registered as a new patient at this facility. She reported no active symptoms of preeclampsia, such as persistent frontal headache, visual disturbances, epigastric pain, or sudden facial or hand edema. However, her clinical history revealed a strong paternal history of essential hypertension, and she had been informed of elevated blood pressure during an early-pregnancy visit elsewhere, suggesting underlying chronic hypertension.

Upon physical examination, her vital signs were highly concerning: her blood pressure was severely elevated at 173/121 mmHg (recorded as 175/121 mmHg on her MCH pink book), confirming severe range hypertension. Her heart rate was stable at 80 beats per minute, her respiratory rate was 20 breaths per minute, and she was afebrile. Anthropometric measurements showed a body weight of 99.0 kg and a height of 160 cm, resulting in a BMI of 38.67 kg/m<sup>2</sup>, classifying her as severely obese (Class II/III obesity). Her upper arm circumference (LILA) was 39 cm, and her abdominal circumference was 108.0 cm. Obstetric palpation revealed a fundal height of 28 cm, with a single fetus in a cephalic presentation and a normal FHR of 123 beats per minute.

Urgent point-of-care laboratory testing at the primary clinic revealed a hemoglobin level of 190

11.5 g/dL and blood type B Rhesus-positive. A qualitative urine protein dipstick test was positive (1+), confirming new-onset proteinuria in the setting of severe hypertension after 20 weeks of gestation.

Her KSPR score was calculated as 12 (base score of 2, plus 4 points for primigravida status, 4 points for severe obesity, and 4 points for severe hypertension/preeclampsia), placing her in the Very High-Risk Pregnancy (KRST) category.<sup>14</sup> Given the combination of severe range blood pressure ( $\geq 160/110$  mmHg) and proteinuria, she was diagnosed with Severe Preeclampsia (ICD-10: O14.1).

The primary care team initiated immediate emergency stabilization. In accordance with clinical guidelines, the patient was prepared for immediate transfer, and her family was counseled regarding the high risk of eclamptic seizures and placental abruption.<sup>11</sup> She was referred urgently to RS DKT Surabaya for inpatient management, where magnesium sulfate (MgSO<sub>4</sub>) therapy and parenteral antihypertensives could be safely administered under close monitoring.

### **Case 3: Chronic Hypertension with Impending Superimposed Preeclampsia**

Mrs. YF, a 28-year-old multigravida (G3P1A1), presented to Puskesmas Tambakrejo on May 18, 2026, at an extremely early gestational age of 4–5 weeks. She presented with a chief complaint of severe, throbbing, bilateral frontal headache and dizziness of several days' duration. Her past obstetric history was highly significant for severe preeclampsia: her first pregnancy, 4.5 years prior, was complicated by severe preeclampsia and prematurity, resulting in an emergency Cesarean section at RS AL. The male infant weighed 00 g and survived. Following that delivery, she had an intrauterine device (IUD) inserted, which was later removed surgically at RS AL in August 2025 due to a lost string. Her second pregnancy ended in a spontaneous first-trimester miscarriage on December 25, 2025. Her family history was positive for essential hypertension in her mother.

On physical examination, her general condition was recorded as fair, and she was fully conscious (GCS 15/15). Her vital signs demonstrated a severe hypertensive crisis: her initial blood pressure was 181/120 mmHg, with subsequent readings of 180/110 mmHg and 174/110 mmHg. Her heart rate was 80 beats per minute, and her respiratory rate was 20 breaths per minute. Her body weight was 90 kg with a height of 170 cm, yielding a BMI of 31.14 kg/m<sup>2</sup> (Class I obesity).

Her upper arm circumference (LILA) was 35 cm. Because of her extremely early gestational age, fundal height was not measurable, and the FHR was not detectable. Preeclampsia screening conducted at the clinic showed a strongly positive Mean Arterial Pressure (MAP) and a positive Roll-Over Test (ROT).

Laboratory investigations revealed a hemoglobin level of 12.4 g/dL, a red blood cell count of 5.03 million/uL, and normal hematocrit indices (MCV 83.2 fL, MCH 24.6 pg). Her random blood glucose was 107 mg/dL. Complete urinalysis demonstrated negative urine protein and glucose. Her blood type was B Rhesus-positive, and triple elimination tests were non-reactive. Given a history of severe preeclampsia, chronic hypertension, and severe range hypertension in the first trimester, her KSPR score was calculated as 12 (Very High-Risk Pregnancy/KRST).<sup>14</sup> She was diagnosed with chronic hypertension with a high risk of superimposed preeclampsia (ICD-10: Z35.8, Supervision of other high-risk pregnancies).

Due to her symptoms and severe range blood pressure, she was initiated on oral Amlodipine 10 mg twice daily. The primary care physician bypassed routine primary care monitoring and referred her immediately to Siloam Hospitals Surabaya for specialized maternal-fetal medicine co-management. This referral was aimed at initiating early low-dose aspirin and high-dose calcium prophylaxis to optimize uterine artery perfusion and prevent early-onset superimposed preeclampsia.

### **Management and Follow-up**

The clinical management of these three patients at Puskesmas Tambakrejo highlights the critical role of primary care as a gatekeeper, stabilizing high-risk pregnant women and coordinating timely referrals.

### **Pharmacological Prophylaxis and Medical Treatment**

For patients identified with moderate-to-high risk factors for preeclampsia (such as advanced maternal age and obesity), Indonesian guidelines (PNPK Preeclampsia) and international standards recommend the initiation of calcium supplementation and low-dose aspirin.<sup>11</sup> In Case 1, the primary care team initiated daily oral Calcium Lactate (500 mg) alongside oral Methyldopa 250 mg twice daily. Methyldopa is a centrally acting alpha-2 adrenergic agonist that remains the

preferred agent for mild-to-moderate gestational hypertension in low-resource settings because of its established safety profile and lack of adverse fetal effects.<sup>17</sup>

In contrast, Case 3 represented a chronic hypertensive crisis in early pregnancy. Because of the severity of her blood pressure (181/120 mmHg) and her prior history of preeclampsia, oral Amlodipine 10 mg twice daily was prescribed. Amlodipine, a dihydropyridine calcium channel blocker, is highly effective for rapid and sustained blood pressure reduction in patients with chronic hypertension and can be safely used throughout pregnancy.<sup>24</sup> In addition to antihypertensive therapy, high-risk patients like Case 3 require early-onset low-dose aspirin (75–150 mg daily, initiated before 16 weeks) combined with high-dose elemental calcium (1.0–1.5 g daily) to mitigate endothelial damage.<sup>24</sup>

For Case 2, who presented with late-onset severe preeclampsia (blood pressure 173/121 mmHg and proteinuria 1+) at 29 weeks of gestation, primary care management shifted from prevention to acute stabilization. Puskesmas Tambakrejo clinicians prioritized preparing the patient for immediate tertiary transfer. Emergency protocol for severe preeclampsia requires the administration of a loading dose of magnesium sulfate (MgSO<sub>4</sub>) to prevent eclamptic seizures, followed by rapid transfer to a secondary or tertiary facility with intensive care and neonatal support.<sup>17</sup>

### The Referral Mechanism

The referral pathway from Puskesmas Tambakrejo is integrated into Surabaya's regional healthcare network, utilizing the National Health Insurance (BPJS Kesehatan) referral system. The referral destination is carefully matched to the patient's risk category:

- **Case 1** was referred to **RS DKT (Rumkitban Surabaya)**, a secondary-level hospital, at 20 weeks of gestation. This planned referral allowed for specialized obstetrical surveillance, serial fetal growth scans, and regular laboratory monitoring without placing an unnecessary burden on tertiary academic centers.
- **Case 2** required urgent, high-priority transfer. She was referred immediately to **RS DKT Surabaya** on May 11, 2026, due to her critical blood pressure and positive proteinuria, allowing for rapid admission to an obstetric high-care unit, initiation of a MGSO<sub>4</sub> infusion,

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and parenteral antihypertensive therapy (e.g., intravenous Labetalol or Hydralazine).

- **Case 3** presented with an extremely high risk of early-onset preeclampsia superimposed on chronic hypertension, complicated by severe obesity and a history of preterm preeclampsia. Her clinical complexity necessitated tertiary-level maternal-fetal medicine care. She was referred immediately to **Siloam Hospitals Surabaya** on May 18, 2026, for specialized screening, including uterine artery Doppler ultrasound and biochemical marker monitoring, to guide her clinical care.<sup>19</sup>

### **Maternal and Fetal Outcomes**

By detecting these risks early and utilizing targeted referral pathways, the primary care team avoided serious complications, such as eclamptic seizures, HELLP syndrome, maternal acute kidney injury (AKI), or acute pulmonary edema.<sup>1</sup> In Case 1, early control of her blood pressure and planned referral ensured a stable transition into the third trimester, minimizing the risk of superimposed preeclampsia and placental abruption.<sup>17</sup> For Case 2, rapid transfer at 29 weeks of gestation enabled the secondary hospital team to administer intramuscular corticosteroids (e.g., Dexamethasone or Betamethasone) to accelerate fetal lung maturity, mitigating neonatal respiratory distress syndrome (RDS) in the event of an indicated preterm delivery.<sup>17</sup> For Case 3, early first-trimester specialist evaluation and aggressive antihypertensive management reduced the risk of early-onset superimposed preeclampsia, which is historically associated with severe fetal growth restriction (FGR), oligohydramnios, and intrauterine fetal death (IUFD).<sup>1</sup>

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## **DISCUSSION**

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### **Physiological Principles of MAP and ROT in Preeclampsia Screening**

In low-resource primary care settings where advanced molecular biomarkers and high-resolution Doppler ultrasound are unavailable, physiological screening tests like Mean Arterial Pressure (MAP) and the Roll-Over Test (ROT) are invaluable.<sup>3</sup> The physiological basis of these tests relies on detecting subclinical cardiovascular alterations and endothelial hyper-reactivity before clinical preeclampsia manifests.<sup>3</sup>

Mean Arterial Pressure represents the average pressure driving blood through the systemic

vasculature throughout a single cardiac cycle.<sup>3</sup> It is mathematically calculated using the formula:

$$MAP = DBP + \frac{SBP - DBP}{3}$$

or

$$MAP = \frac{SBP + 2(DBP)}{3}$$

In a healthy pregnancy, peripheral vascular resistance falls during the first and second trimesters due to progesterone-mediated smooth muscle relaxation and increased nitric oxide production.<sup>3</sup> Consequently, maternal blood pressure and MAP physiological decline.<sup>29</sup> However, in women with underlying endothelial damage or incomplete trophoblastic invasion, this systemic vasodilation is impaired.<sup>3</sup> An elevated MAP ( $\geq 90$  mmHg) during the early second trimester serves as a surrogate marker for subclinical vasospasm and increased vascular tone, predicting preeclampsia with high specificity.<sup>3</sup>

The Roll-Over Test is a dynamic clinical maneuver performed between 28 and 32 weeks of gestation.<sup>13</sup> The patient first lies in the left lateral recumbent position, and her blood pressure is recorded once stabilized.<sup>5</sup> She is then rolled onto her back (supine position), and her blood pressure is measured again after 5 minutes.<sup>5</sup> The ROT value is calculated as:

$$ROT = \text{Diastolic BP (Supine)} - \text{Diastolic BP (Left Lateral Recumbent)}$$

A positive ROT is defined as an increase in diastolic blood pressure of  $\geq 15$  mmHg upon rolling supine.<sup>3</sup> The physiological mechanism behind this test is twofold:

1. **Mechanical Compression:** Rolling supine causes the gravid uterus to compress the inferior vena cava, decreasing venous return and cardiac output.<sup>5</sup>
2. **Sympathetic Compensation:** In response to decreased cardiac output, baroreceptors trigger a sympathetic discharge, causing systemic vasoconstriction to maintain cerebral and coronary

perfusion.<sup>3</sup>

In a healthy pregnancy, the vascular endothelium is highly resistant to sympathetic pressor agents and angiotensin II, thanks to high levels of vasodilatory prostacyclin and nitric oxide.<sup>3</sup> Consequently, the diastolic pressor response to this positional change is minimal.<sup>3</sup> In contrast, in a patient with subclinical preeclampsia, endothelial dysfunction and impaired vasodilatory pathways lead to vascular hyper-reactivity.<sup>3</sup> The sympathetic discharge triggers intense vasoconstriction, resulting in a diastolic blood pressure increase of  $\geq 15$  mmHg.<sup>3</sup> In Case 3, the strongly positive MAP and ROT underscored her severe vascular dysfunction, prompting immediate therapeutic intervention and transfer.

### **The Poedji Rochjati Score Card (KSPR) in Risk Stratification**

The KSPR remains an essential tool for community-based obstetric risk screening in Indonesia.<sup>13</sup> This card-based system uses a cumulative scoring methodology, assigning weight (4 or 8 points) to specific risk factors, including maternal age, parity, height, interpregnancy interval, and pre-existing medical conditions.<sup>14</sup> By combining these clinical parameters into a single score, the KSPR allows community midwives and primary care physicians to rapidly categorize patients:

- **Low-Risk Pregnancy (KRR, score 2):** Patients can safely deliver at primary health care centers or integrated maternity clinics under midwife supervision.<sup>14</sup>
- **High-Risk Pregnancy (KRT, score 6–10):** Patients require active physician management at the primary care level, with planned referrals to secondary hospitals for delivery.<sup>14</sup>
- **Very High-Risk Pregnancy (KRST, score  $\geq 12$ ):** Patients require immediate, direct referral to tertiary medical centers for comprehensive, multidisciplinary management.<sup>14</sup>

In this case series, the KSPR successfully identified risk levels in all three patients. For Case 1, her age (38 years) and prolonged birth spacing (>10 years) yielded a high-risk score of 6, prompting early calcium and Methyldopa prophylaxis and a structured referral to RS DKT.<sup>14</sup> For Case 2, her severe obesity, primigravida status, and severe range hypertension resulted in a very high-risk score of 12, indicating the need for immediate transfer.<sup>14</sup> For Case 3, her history of preterm preeclampsia, chronic hypertension, and severe early-pregnancy hypertension gave her a

score of 12, bypassing primary care and directing her to tertiary maternal-fetal surveillance.<sup>14</sup>

### **Comparative Analysis with International and National Guidelines**

The clinical management at Puskesmas Tambakrejo aligned closely with national guidelines (POGI/Kemenkes PNPk Preeklampsia) and international standards (ACOG and WHO).<sup>11</sup>

- **Prophylaxis:** ACOG, WHO, and POGI guidelines recommend initiating low-dose aspirin (75–150 mg/day) and calcium supplementation (1.0–2.0 g/day) before 16 weeks of gestation for patients with at least one high-risk factor (e.g., prior preeclampsia, chronic hypertension) or two or more moderate-risk factors (e.g., obesity, advanced age, primigravida).<sup>11</sup> In Case 1, Calcium Lactate was initiated based on her moderate-risk profile. In Case 3, her early presentation at 4-5 weeks of gestation and her high-risk profile (prior preeclampsia and chronic hypertension) made her an ideal candidate for early-onset, high-dose aspirin and calcium prophylaxis, which was initiated upon her referral to Siloam Hospitals.<sup>19</sup>
- **Hypertension Management:** ACOG and POGI guidelines state that severe range hypertension ( $\geq 160/110$  mmHg) requires immediate, rapid-acting antihypertensive therapy to reduce the risk of maternal stroke and cardiovascular complications.<sup>18</sup> In Case 2, her severe range blood pressure (173/121 mmHg) was recognized as an emergency, prompting immediate referral. In Case 3, oral Amlodipine 10 mg twice daily was prescribed to control her chronic hypertensive crisis.
- **Diagnostic Criteria:** In the past, the diagnosis of preeclampsia relied heavily on the combination of hypertension and proteinuria.<sup>18</sup> Modern guidelines (ACOG and POGI) have updated this paradigm, stating that preeclampsia can be diagnosed in the absence of proteinuria if hypertension is accompanied by other severe features, including thrombocytopenia (platelet count  $<100,000/\mu\text{L}$ ), renal insufficiency (creatinine  $>1.1$  mg/dL), impaired liver function (elevated transaminases), pulmonary edema, or persistent neurological symptoms (visual disturbances or severe headache).<sup>10</sup> Case 2 met the classic criteria for severe preeclampsia, presenting with severe hypertension and 1+ proteinuria. Case 3, despite having negative proteinuria, was identified as high risk due to chronic hypertension and persistent, severe headache, indicating early-onset endothelial activation.<sup>18</sup>

## Systemic Gaps and Gaps in Primary Care Implementation

Despite the successful management of these three cases, this series highlights several systemic challenges within the primary healthcare network in Indonesia:

1. **Lack of Quantitative Diagnostic Tools:** Primary care clinics (Puskesmas) often lack quantitative protein assays, such as spot urine protein-to-creatinine ratios or 24-hour urine collections, relying instead on qualitative dipsticks.<sup>3</sup> This can lead to diagnostic errors, particularly in early-stage preeclampsia or in patients with dilute urine.<sup>18</sup>
2. **Midwifery and Medical Workload:** High patient volumes and administrative duties at Puskesmas frequently result in incomplete risk documentation in the Buku KIA, which can delay the recognition of critical trends in maternal weight gain and blood pressure.<sup>7</sup>
3. **Availability of Prophylactic Agents:** While low-dose aspirin and calcium are cost-effective, their availability can be inconsistent in remote primary care settings, highlighting the need for stable pharmaceutical supply chains.<sup>2</sup>
4. **Access to Advanced Screening:** Advanced preeclampsia screening tools, such as the soluble fms-like tyrosine kinase-1 to placental growth factor ratio (sFlt-1/PlGF ratio) and uterine artery Doppler ultrasound, are unavailable in primary care.<sup>13</sup> Consequently, primary care clinics must rely on physical exam findings, KSPR, MAP, and ROT to guide clinical decisions.<sup>3</sup>

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## CONCLUSION

This case series demonstrates that primary health care (PHC) facilities are essential for the early detection, stabilization, and referral of pregnant women at risk for preeclampsia. Utilizing standardized screening tools, such as the Maternal and Child Health Book (Buku KIA), Poedji Rochjati Score Card (KSPR), Mean Arterial Pressure (MAP), and the Roll-Over Test (ROT), allows clinicians to identify high-risk patients before severe complications develop. As shown in the three cases from Puskesmas Tambakrejo, timely risk stratification enables appropriate calcium and antihypertensive therapy, immediate stabilization of hypertensive emergencies, and structured referrals to secondary or tertiary facilities.

To improve the quality of preeclampsia screening and reduce maternal mortality, the following clinical and systemic recommendations are proposed:

1. **Digitalization of Screening Tools:** Integrate the KSPR and preeclampsia screening sheets into electronic medical record (EMR) systems (such as e-Puskesmas or e-Posyandu applications).<sup>14</sup> This digitalization can help prevent documentation errors and automatically calculate risk scores, triggering clinical alerts for providers.
2. **Standardization of Physiological Screening:** Mandate the calculation of MAP at the first prenatal visit and perform the ROT between 28 and 32 weeks of gestation for all pregnant women, ensuring these results are documented in the Buku KIA.<sup>3</sup>
3. **Securing the Supply Chain:** Ensure a reliable and continuous supply of low-dose aspirin (75–150 mg) and high-dose calcium supplements at the primary care level, making them readily available to all high-risk patients during early gestation.<sup>11</sup>
4. **Professional Training and Education:** Conduct regular training programs for primary care physicians, midwives, and community health volunteers (Kader) to align local practices with updated POGI, ACOG, and WHO guidelines.<sup>7</sup> Training should emphasize non-proteinuric preeclampsia phenotypes and the critical timing of prophylactic interventions.

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