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Characteristics of preeclampsia cases based on early-onset and late-onset preeclampsia at Batuyang Primary Health Center in 2022–2024

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ABSTRACT

Introduction: Preeclampsia remains one of the leading causes of maternal and neonatal morbidity and mortality in Indonesia, with a significant incidence during pregnancy. It is classified into early-onset preeclampsia (EOPE) and late-onset preeclampsia (LOPE) based on the gestational age at the time of diagnosis, each characterized by distinct clinical presentations and etiological mechanisms. This study aims to compare demographic and clinical characteristics between early-onset pre-eclampsia (EOPE) and late-onset pre-eclampsia (LOPE) at PKM Batuyang during the period 2022–2024.

Methods: This study employed a retrospective cross-sectional design with non-probability sampling. Data were obtained from the medical records of preeclamptic patients treated at Batuyang Primary Health Center between 2022 and 2024. The analyzed variables included maternal age, gestational age, parity, body mass index (BMI), history of abortion, hypertension, diabetes mellitus, and multiple pregnancies.

Results: Among the 162 preeclampsia cases reviewed, LOPE was more prevalent (84.6%) compared to EOPE (15.4%). Most cases occurred in women aged ≥35 years and those with multiparity. The majority of patients had a BMI below 30 kg/m^2. A small proportion of patients had a history of chronic hypertension, diabetes mellitus, or multiple gestation.

Conclusion: Late-onset preeclampsia was more frequently observed than early-onset cases at Batuyang Primary Health Center. Classification based on onset time is essential to guide optimal clinical management strategies. Further research is needed to identify risk factors to improve early detection and management of pre-eclampsia, thereby potentially reducing maternal and infant morbidity and mortality rates.

Keywords: Early-Onset Preeclampsia, Pregnancy, Late-Onset Preeclampsia, Preeclampsia.
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INTRODUCTION

The development of the health sector in Indonesia to date still shows vulnerability in the area of maternal and child health, as indicated by high mortality rates in both groups. Pre-eclampsia is one of the dominant factors contributing to maternal mortality. Hypertension during pregnancy poses a significant threat to the health of both the mother and the foetus. Pre-eclampsia is one of the most commonly reported medical conditions associated with pregnancy complications, with a prevalence of approximately 2 to 15% of all pregnancies.[1]

Preeclampsia is defined as a hypertensive disorder that arises after 20 weeks of gestation, accompanied by proteinuria or generalised oedema, and may be accompanied by certain haematological abnormalities such as thrombocytopenia, or signs of target organ damage such as renal dysfunction, hepatic dysfunction, pulmonary oedema, and cerebral or visual impairment.[2] If not treated adequately or if it develops into a severe form, this condition can cause systemic complications involving multiple organs, as well as disrupt blood flow to the placenta, which can affect foetal growth and development and lead to premature birth. In advanced stages, pre-eclampsia can become a life-threatening condition, with an increased risk of morbidity and mortality for both mother and baby.[3]

The main mechanism thought to play a role in the aetiology of pre-eclampsia and eclampsia is uteroplacental ischaemia. This theory is based on findings of placental infarction in eclampsia patients, as well as experimental studies in animals showing that subcutaneous injection of autolysed human placental extract into guinea pigs can cause seizures, focal liver necrosis, and renal lesions, similar to the pathological findings in women who died from eclampsia.[4]

Preeclampsia can be classified into two groups based on gestational age: early-onset preeclampsia (EOPE) and late-onset preeclampsia (LOPE). The gestational age cutoff used is generally 34 weeks or 37 weeks. Based on this classification,

pre-eclampsia can be subclassified into early onset pre-eclampsia (gestational age < 34 weeks), late onset pre-eclampsia (gestational age ≥ 34 weeks), preterm (gestational age < 37 weeks), and term (gestational age ≥ 37 weeks). The timing of diagnosis during pregnancy may indicate differences in the underlying pathophysiological pathways and aetiology.[3]

In EOPE, placental abnormalities are the main cause of this condition. Examination of the placenta in cases of pre-eclampsia often reveals multiple placental infarcts and arterial sclerosis. This is related to placental hypoperfusion due to trophoblast invasion disorders, which ultimately cause placental ischaemia. In contrast, LOPE is caused by the interaction between a normal placenta and maternal factors that ultimately result in microvascular damage. One of the mechanisms thought to be involved is endothelial dysfunction in the mother. Because maternal preeclampsia generally occurs in later stages of pregnancy, treatment can be expectant until 37 weeks of gestation. This condition usually does not cause significant changes in arterial conversion, so placental perfusion is maintained.[4]

According to a report by the Indonesian Ministry of Health (2020), the main causes of high maternal mortality rates in Indonesia in 2020 included haemorrhage in 1,280 cases (30.32%), hypertension in pregnancy in 1,066 cases (25.2%), and infection in 207 cases (4.9%). Based on data from the Banjarmasin City Health Office in 2023, out of a total of 19 maternal deaths, hypertension in pregnancy (including gestational hypertension, pre-eclampsia, and eclampsia) was the most common cause with 5 cases.[5] Based on these data, this study aims to compare demographic and clinical characteristics (such as age, parity, BMI, and medical history) between cases of early-onset pre-eclampsia (EOPE) and late-onset pre-eclampsia (LOPE) at PKM Batuyang during the period 2022–2024.

METHODS

This study used a retrospective cross-sectional design with non-probability or non-random sampling techniques to identify the prevalence and characteristics of pre-eclampsia cases in pregnant women at the Batuyang Community Health Centre, taking into account the time of onset of symptoms (both early onset (EOPE) and late onset (LOPE)). The research data used was sourced from the medical records of pre-eclampsia patients recorded at the Batuyang Community Health Centre from 2022 to 2024. The inclusion criteria for this study were pregnant women with either early-onset or late-onset pre-eclampsia, diagnosed by a specialist in obstetrics and gynaecology. The information collected included: patient identity, maternal age and gestational age, parity, body mass index (BMI), history of abortion, history of hypertension, history of diabetes mellitus (type 1 or type 2), and the presence or absence of multiple pregnancies. Incomplete medical records were an exclusion criterion in this study. Official permission to conduct the study was obtained before data collection. The local Ethics Committee has approved this study. After obtaining the medical record data, the study continued with data processing and analysis using Statistical Product and Service Solutions (SPSS) version 29 statistical software. The results of the data analysis will be presented in the form of frequency tables and percentages.

RESULTS

In this study, 162 medical records of patients with pre-eclampsia were obtained after excluding 16 incomplete medical records. **Figure 1** shows that of the 162 medical records obtained from PKM Batuyang from 2022 to 2024, patients with late-onset pre-eclampsia (LOPE) were more numerous than those with early-onset pre-eclampsia (EOPE), with a sample ratio of 137 (84.6%) to 25 samples (15.4%).

Based on **Table 1**, the mean age of mothers in this study was 33.62 years with a standard deviation of 10.3 years. A total of 14 out of 25 cases of EOPE (56%) and 73 out of 137 cases of LOPE (53.28%) occurred in multiparous mothers. Overall, multiparas accounted for 87 cases (53.7%) of the total sample. A total of 13 samples (8%) were known to have a history of hypertension, consisting of 4 samples (2.4%) with early onset and 9 samples (5.5%) with late onset.

Based on DM history, only 2 samples had DM, namely 1 sample from early-onset pre-eclampsia and 1 sample from late-onset pre-eclampsia. Based on medical record data related to a history of multiple pregnancies, 4 samples experienced multiple pregnancies, namely

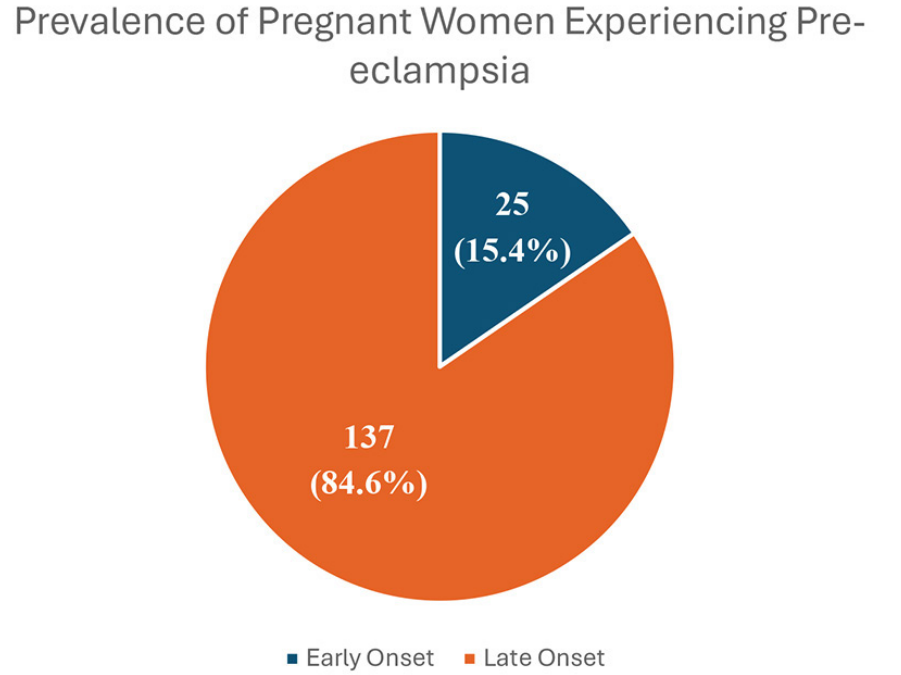

Figure 1. Prevalence of Pregnant Women with Pre-eclampsia at Batuyang Community Health Centre in 2022-2024

Table 1. Research Sample Characteristics

Variables		Preeclampsia				Total (%)
		Early onset (N=25)		Late Onset (N=137)		
		N	%	N	%	
Maternal Age	< 35 years old	13	52	62	45.26	75 (46.3)
	≥ 35 years old	12	48	75	54.74	87 (53.7)
	Means ± SD			33.62 ± 10.3		
Parity	Nullipara	8	32	28	20.44	36 (22.22)
	Primipara	3	12	31	22.63	34 (20.98)
	Multipara	14	56	73	53.28	87 (53.7)
	Grandepara	0	0	5	3.65	5 (3.08)
Body Mass Index (BMI)	< 30 kg/m^2	25	100	125	91.24	150 (92.59)
	≥ 30 kg/m^2	0	0	12	8.76	12 (7.4)
History of Abortion	Yes	8	32	21	15.33	29 (17.9)
	No	17	68	116	84.67	133 (82.09)
History of Hypertension	Yes	4	16	9	6.57	13 (8.02)
	No	21	84	128	93.43	149 (91.97)
History of Diabetes Mellitus (DM)	Yes	1	4	1	0.73	2 (1.23)
	No	24	96	136	99.27	160 (98.76)
Multiple Pregnancy	Yes	3	12	1	0.73	4 (2.47)
	No	22	88	136	99.27	158 (97.53)

3 (1%) samples from early onset and 1 (0.6%) sample from late onset.

DISCUSSION

Figure 1 and **Table 1** show that the characteristics of this study consisted of 162 pregnant women with pre-eclampsia, ranging in age from 16 to 48 years, with a mean age of 33.62 years. The results of this study also show that the late-onset pre-eclampsia group (84.6%) was larger than the early-onset pre-eclampsia group (15.4%). The results of this study are similar to those of Salam et al., who found more late-onset pre-eclampsia (514 samples) than early-onset pre-eclampsia (41 samples). The results of this study indicate that pre-eclampsia occurs more frequently in women aged 20-35 years. Based on parity, the results of this study also show similar findings, with multigravida patients dominating (320 samples). Another study conducted by also shows similar findings, with the highest incidence of pre-eclampsia in pregnant women aged 20-30 years and the highest parity in multiparous women.[6] However, research conducted by Cita et al. shows that the prevalence of early-onset pre-eclampsia is more dominant, with 90 cases (86%), while late-onset pre-eclampsia accounts for 15 cases (14%).[7]

Early-onset pre-eclampsia (EOPE) is generally caused by disturbances in the placentation process and trophoblast invasion failure, resulting in placental ischaemia and clinical manifestations in early pregnancy. In contrast, late-onset pre-eclampsia (LOPE) is more related to maternal constitutional factors such as advanced age, obesity, or pre-existing cardiovascular and metabolic diseases, as well as increased maternal vascular sensitivity in the late trimester, compared to severe placental dysfunction.[3]

In EOPE, placental vascular abnormalities are the main trigger. Failure of trophoblast remodelling of the spiral arteries inhibits optimal blood flow to the placenta, causing chronic hypoxia and the release of antiangiogenic compounds into the maternal circulation, which triggers severe clinical symptoms before 34 weeks of pregnancy, including hypertension, proteinuria, and multiple organ dysfunction, as well as foetal growth restriction. In contrast, LOPE is more influenced by maternal systemic disorders, including pre-existing vascular abnormalities. In this condition, the placenta usually does not experience dysfunction, but as the metabolic and circulatory load increases, the mother's body cannot adapt well. As a result, high blood pressure and proteinuria appear after 34 weeks, usually with milder symptoms and less prominent foetal growth restriction.[8]

In this study, the majority of patients had a BMI < 30 (150 samples). Based on previous studies, an increase in BMI prior to pregnancy (>25 kg/m^2) contributes to the risk of pre-eclampsia through adipokine-mediated endothelial dysfunction and chronic inflammatory processes. Adipose tissue releases pro-inflammatory cytokines such as leptin and TNF-α, which interfere with trophoblast invasion and increase oxidative stress, thereby reducing placental perfusion.[9] Other literature indicates that individuals who are overweight or obese have a significantly higher risk of pre-eclampsia

compared to those with a normal BMI. Excessive weight gain during pregnancy also exacerbates this risk, particularly in obese patients.[10]

The history of abortion in this study consisted of 8 samples in early-onset pre-eclampsia and 21 samples in late-onset pre-eclampsia. A history of recurrent and incomplete abortion was associated with a 3.45-fold increase in the risk of pre-eclampsia due to residual damage to the vascular endothelium, which can interfere with subsequent placental implantation.[11] However, a cohort study in Japan with a population of 5,206 people found no significant association between a history of abortion and the incidence of pre-eclampsia (p=0.91), indicating population-dependent variation.[12]

In this study, only 13 samples had a history of hypertension. Chronic hypertension is one of the main risk factors for preeclampsia because it worsens systemic blood flow obstruction and disrupts blood flow control to the placenta. Abnormal responses to antiangiogenic compounds such as soluble Fms-Like Tyrosine Kinase-1 (sFlt-1) in hypertensive patients accelerate the development of preeclampsia symptoms, including proteinuria and impaired function of vital organs.[8]

The history of DM in this study consisted of only two samples, in which hyperglycaemia was associated with the formation of advanced glycation end-products (AGEs) in the placental blood vessels, increasing oxidative stress and inhibiting VEGF signalling. Patients with DM have a higher risk of pre-eclampsia due to increased sFlt-1 production and decreased angiogenic capacity.[13,14] Multiple pregnancies in this study consisted of four samples, in which pregnancies with more than one foetus carried a high risk of pre-eclampsia due to increased placental mass and greater haemodynamic demands. The increase in antiangiogenic factors released into the mother's circulation exceeded the body's ability to adapt, thereby accelerating the onset of pre-eclampsia, often with an earlier onset than in single pregnancies.[15]

This study has several strengths, including a retrospective cross-sectional design that allows for analysis of data from a relatively large patient population over a specific period of time, as well as data collection from medical records at primary care facilities that represent the burden of cases at the community level. However, there are several limitations. Data from medical records carries the risk of incompleteness and variation in documentation. Furthermore, the use of a cross-sectional design hinders the assessment of causal relationships between risk factors and pre-eclampsia. The limited scope of the study to one community health centre also limits the generalisation of the findings. For future research, it is recommended to conduct prospective or cohort studies in several health facilities with broader coverage, which can measure variables more comprehensively and monitor the long-term outcomes of mothers and babies. This approach will provide a deeper understanding of the pathophysiology and determinants of EOPE and LOPE in the context of the Indonesian population.

CONCLUSION

It can be concluded that in Batuyang PKM, late-onset pre-eclampsia (LOPE) is more prevalent than early-onset pre-eclampsia (EOPE), with the majority of cases occurring in women aged ≥35 years and multiparous women. Classification based on onset time has important clinical implications, where EOPE is more associated with early placental abnormalities, while LOPE is more influenced by maternal factors. Identification of specific risk factors and different management approaches for both groups are needed to improve early detection and reduce maternal and infant morbidity.

ETHICAL STATEMENT

This study has received ethical clearance from the local ethics committee.

AUTHOR CONTRIBUTION

All authors contributed to the study's conception, literature review, analysis, manuscript drafting, and revisions. All authors approved the final version for publication and agree to be accountable for the work.

CONFLICT OF INTEREST

The authors declare no competing interests.

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