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Original Article

Risk Factors, Complications, and Outcome of Early and Late Onset Pre-Eclampsia in a Tertiary Care Hospital

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ABSTRACT

Early-onset preeclampsia is linked to a greater number of maternal and neonatal complications than late-onset preeclampsia. **Objective:** To evaluate the risk factors, maternal complications, and neonatal outcomes associated with early- versus late-onset preeclampsia in a tertiary care setting. **Methods:** A 4-month comparative analytical study was performed at the Gynecology Ward at Civil Hospital, Karachi, from October 2025 to January 2026. The study included 90 pregnant women with hypertensive disorders of pregnancy who were recruited (45 EO-PE and 45 LO-PE). Women aged between 15 and 40 years old who spontaneously conceived without artificial insemination were eligible. SPSS version 26 was used to analyze the data. Associations were investigated using descriptive statistics. Associations were evaluated using binary logistic regression; a p-value <0.05 was considered statistically significant. **Results:** The mean age of women with early-onset preeclampsia was 28.6 ± 5.4 years compared with 29.2 ± 5.1 years among those with late-onset preeclampsia, while an interpregnancy interval >10 years was also more frequent among eligible multiparous women with early-onset preeclampsia (56.5% vs. 24.0%; p=0.013). EO-PE was correlated with more maternal complications, such as abruption placentae (15.6% vs. 2.2, p=0.020), HELLP syndrome (11.1% vs. 0%, p=0.010), and eclampsia (8.9% vs. 0%, p=0.040). Neonates born to EO-PE mothers were found to have lower birth weights (2.25 =0.45 kg vs. 2.78 =0.38 kg, p=0.001) and increased NICU admissions (46.7% vs. 20%, p=0.007). EO-PE was found to increase the odds of both maternal complications and NICU admission. **Conclusion:** Preeclampsia in the first trimester is linked with increased maternal and neonatal risks compared to those experienced in the latter.

INTRODUCTION

Hypertensive disorder of pregnancy, preeclampsia, affects multiple organ systems and remains a leading cause of maternal and perinatal morbidity worldwide [1]. It is usually divided and categorized as EO-PE for early-onset and LO-PE for late-onset preeclampsia; the former transpires at a stage below 34 weeks of gestation (or less), whereas the latter appears at a stage above 34 weeks (or more). Clinical significance of distinguishing the two subtypes, considering that EO-PE is commonly linked with the heightened maternal disease severity and poorer perinatal outcomes than LO-PE [2]. Some of the studies have indicated differences in prevalence and clinical features between EO-PE and LO-PE. Cross-sectional research in Pakistan showed that EO-PE is less prevalent compared to LO-PE but likely to exhibit an increased disease severity and negative obstetric and neonatal outcomes [3]. In the long term, some studies have also pointed out that a previous diagnosis of early-onset preeclampsia predisposes individuals to greater cardiovascular risk in later life [4]. Mothers have been found to contain maternal factors such as gain of gestational weight, comorbidities, and past obstetric history as significant predictors of preeclampsia onset and severity [5]. The schedule of birth is a very important issue when it comes to maternal and neonatal outcomes [6]. Premature birth during EO-PE can decrease maternal morbidity but tends to lead to preterm

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birth and neonatal morbidity [7]. Retrospective observational studies have found that both forms of preeclampsia—early and late onset—have been identified as significant risk determinants. [8]. In a resource-limited environment, in terms of maternal and perinatal complications, which include Delivery before term, reduced birth weight, neonatal intensive care admission, and perinatal mortality [9]. Moreover, comparative studies revealed that EO-PE is linked to more severe and potentially life-threatening maternal complications, including HELLP syndrome, renal insufficiency, and eclampsia, but the LO-PE is mainly associated with maternal blood pressure regulation and less severe perinatal morbidity [10].

Although the body of evidence regarding early- and late-onset preeclampsia is growing, there is still no unified local data on the comparison of their risk factors, maternal complications, and perinatal outcomes, especially in the tertiary care settings with limited resources. The majority of studies available are either carried out in other populations or lack a comparative study of both subtypes in the same cohort. Thus, the research aimed to compare and assess the maternal risk factors, clinical manifestations, and fetal outcomes of early-onset and late-onset preeclampsia at a tertiary care hospital in order to produce context-specific evidence that could inform prompt management interventions and enhance the overall pregnancy outcomes.

METHODS

A comparative analytical study was executed in the Gynecology Ward 02 of Dr. Ruth K.M. Pfau Civil Hospital, Karachi, for 4 months starting from October 2025 to January 2026. The date of synopsis approval was September 30, 2025. The institutional review board gave ethical approval (IRB-4163/DUHS/Approval/2025/363; dated 30th September 2025), and informed consent was received in writing by all the participants before enrolment. The study involved 90 pregnant women (45 of them in each group). Sample size was calculated using OpenEpi with a standard 95% confidence level and 80% power. Based on previous local data (cite appropriate reference), the expected proportion of low birth weight in EO-PE was 90% and in LO-PE was 55%, yielding a minimum of 42 women per group. To account for dropouts, we enrolled 45 per group (total N=90) [11]. Outcome definitions were pre-specified: NICU admission defined as transfer to the neonatal intensive care unit within 24 hours of birth for any indication; Stillbirth defined as fetal death at ≥22 weeks of gestation or birth weight ≥500g; Neonatal death defined as death within the first 28 days of life. Maternal complications were defined as the occurrence of any of the following: abruption, HELLP, eclampsia, AKI, or ICH. Participants were recruited using a consecutive sampling technique, including all eligible patients presenting during the study period until the required sample size was achieved. Women with hypertensive disorders of pregnancy (preeclampsia) (new-onset hypertension after 20 weeks of gestational age) with proteinuria and/or dysfunction of end-organs who were pregnant between 15 and 40-years old were taken into account regardless of the gravida and parity. Women below 20 gestational weeks, multiple pregnancies, already having a medical health condition, including diabetes, autoimmune, and renal disorders, and with a history of drug abuse were excluded. Preeclampsia was indicated as new hypertension in a 20-week post-partum gestation, with proteinuria or any signs of maternal organ disorders or uteroplacental inadequacy. They were classified as having early-onset preeclampsia when they were diagnosed with preeclampsia occurring EO-PE refers to preeclampsia developing before 34 weeks, whereas LO-PE refers to onset at 34 weeks of gestation or later. A structured proforma and patient medical records were used as data collection tools, which incorporated demographic variables and obstetric variables which comprised of previous or family history of hypertension and interpregnancy interval of more than ten years, maternal complications which included abruptio placentae, eclampsia, HELLP syndrome, acute kidney injury, and intracranial hemorrhage and neonatal outcomes, including birth weight, NICU admission, stillbirth, and neonatal death.

SPSS version 26.0 was used in data analysis. The baseline characteristics of the study population were described using descriptive statistics, and binary logistic regression was run to determine the relationship that existed between preeclampsia onset, risk factors, maternal complications, and neonatal outcomes. Adjusted odds ratios (AOR) with 95% confidence intervals were reported. A p-value below 0.05 was considered to be statistically significant.

RESULTS

The study included 90 women, with equal distribution between the EO-PE group (n=45) and the LO-PE group (n=45)(Table 1).

Table 1: Baseline Characteristics and Risk Factors of the Participants(n=90)

Variables	EO-PE (n=45)	LO-PE (n=45)	p-value
Age (Years), Mean ± SD	28.6 ± 5.4	29.2 ± 5.1	0.540
Primigravida, n (%)	22 (48.9)	20 (44.4)	0.660
BMI (kg/m^2), Mean ± SD	27.3 ± 3.5	26.8 ± 3.1	0.420
Previous/Family History of Hypertension, n (%)	19 (42.2)	11 (24.4)	0.048*
Interpregnancy interval >10 years, n (%)†	13 (56.5%)	6 (24.0%)	0.013*

†Among women with a previous pregnancy only

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EO-PE was associated with significantly greater occurrence of abruptio placentae (15.6% vs. 2.2%, p=0.020), HELLP syndrome (11.1% vs. 0%, p=0.010), and eclampsia (8.9% vs. 0%, p=0.040) compared to LO-PE. No cases of intracranial hemorrhage or acute kidney injury were observed in either group (Table 2).

Table 2: Comparison of Maternal Complications in Early- and Late-Onset Preeclampsia

Complications	EO-PE (n=45)	LO-PE (n=45)	p-value
Abruptio placentae, n (%)	7 (15.6)	1 (2.2)	0.020*
HELLP syndrome, n (%)	5 (11.1)	0 (0)	0.010*
Eclampsia, n (%)	4 (8.9)	0 (0)	0.040*
Acute kidney injury, n (%)	0 (0)	0 (0)	–
Intracranial hemorrhage, n (%)	0 (0)	0 (0)	–

Stillbirth occurred in 4.4% of EO-PE cases and 2.2% of LO-PE cases (p=0.560). No neonatal deaths were reported during the study period (Table 3).

Table 3: Neonatal Outcomes in Early- and Late-Onset Preeclampsia

Outcomes	EO-PE (n=45)	LO-PE (n=45)	p-value
Birth weight (kg), mean ± SD	2.25 ± 0.45	2.78 ± 0.38	<0.001*
NICU admission, n (%)	21 (46.7)	9 (20)	0.007*
Stillbirth, n (%)	2 (4.4)	1 (2.2)	0.560
Neonatal death, n (%)	0 (0)	0 (0)	–

The binary logistic regression analysis showed that the onset of preeclampsia in early pregnancy was independently related to higher odds of adverse outcomes. In particular, EO-PE had a much higher risk of maternal complications (adjusted odds ratio [AOR] = 3.8; 95% confidence interval [CI]: 1.212.0; p=0.020) and NICU admission (AOR=3.1; 95% CI: 1.37.6; p=0.010) relative to late (Table 4).

Table 4: Binary Logistic Regression for Maternal Complications and NICU Admission in Early- versus Late-Onset Preeclampsia

Outcomes	Variable	AOR (95% CI)	p-value
Maternal complications	EO-PE vs LO-PE	3.8 (1.2–12.0)	0.020*
NICU admission	EO-PE vs LO-PE	3.1 (1.3–7.6)	0.010*

*Significant at $p \leq 0.05$

DISCUSSION

The results of this study are in line with previous studies that have shown that early-onset preeclampsia (ED-PE) is linked to worse maternal and newborn conditions than late-onset preeclampsia (LO-PE). According to Gangadhar et al., there were significant maternal complications, preterm birth, and unfavorable perinatal outcomes in women with EO-PE before 28 weeks, which highlight the severity of this complication [12]. Equally, research on assisted reproductive technologies indicates that EO-PE could have some underlying placental or endometrial abnormalities, and this once again does support the biological differences between EO-PE and LO-PE [13]. EO-PE was associated with significantly lower APGAR scores, more NICU admissions, and perinatal mortality, which is consistent with a retrospective cohort study in Indonesia that found low APGAR scores to be a significant complication in infants born to preeclamptic mothers [14]. Van Esch *et al.* also showed that EO-PE significantly increases the risk of perinatal mortality and serious neonatal conditions, which supports the findings in our cohort [15]. Comparative studies from India and other low-resource settings have similarly shown that EO-PE is associated with reduced birth weights and higher rates of neonatal intensive care admissions relative to LO-PE [16]. These results underscore the paramount significance of early diagnosis and risk stratification in at-risk pregnancies due to EO-PE. Even in high-income settings like the US, hypertensive disorders remain a leading cause of maternal mortality, highlighting the universal importance of our findings, which are particularly relevant to low-resource settings like Pakistan [17]. The systematic reviews and recommendations by the US Preventive Services Task Force highlight that early screening combined with preventive interventions like low-dose aspirin in high-risk women can reduce adverse outcomes of the mother and the baby [16, 18]. Although our study did not evaluate prophylactic interventions, the high burden of complications in EO-PE supports the rationale for early screening. However, since we excluded women with chronic comorbidities, our findings specifically address de-novo EO-PE, and the generalizability of USPSTF aspirin recommendations to this pure subset warrants further investigation. The absence of acute kidney injury and intracranial hemorrhage in our cohort is notable but likely reflects the relatively small sample size and the younger age profile of our patients, rather than true absence of risk. Larger studies are needed to detect these rare but life-threatening events [19]. In management guidelines, the importance of taking into consideration the individual risk factors is always emphasized. Elawad *et al.* indicated that the risk factors that are recommended by the guidelines, including existing hypertension, old age of the mother, and the period between pregnancies, fit well with the clinical predictors of EO-PE [20]. Tertiary Chinese cohort studies also reported that EO-PE is associated with increased incidences of severe maternal and perinatal complications, and the importance of early diagnoses and early interventions in multinational settings was reaffirmed [21]. On the whole, these findings support the importance of differentiating EO-PE and LO-PE in clinical practice. Early identification provides an opportunity to monitor, stabilize, and plan neonatal care carefully.

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Recognizing women at risk with obstetric history, lab markers, and close monitoring can contribute to a decrease in adverse outcomes and better maternal and infant health. our study did not test preventive strategies, the significant burden of complications in EO-PE reinforces the need for heightened clinical vigilance. Future interventional studies in our population are urgently needed to evaluate the cost-effectiveness of early screening and aspirin prophylaxis, especially given the limited resources in our setting.

This research was limited in a number of ways. The first is that it was carried out in one tertiary care hospital and has a rather limited sample size, which raises questions about the ability of the study to be utilized for other populations. Second, it had a cross-sectional study design, which does not allow for establishing causal links between the risk factors and maternal or neonatal outcomes. Third, some of the risk factors were collected using medical records and patient recall, and hence, information bias was introduced. Lastly, there were some laboratory and imaging tests that could have further defined the severity of the disease, which were not equally available as a result of limited resources. Future studies ought to consider large-scale, multicenter, prospective studies in order to confirm the differences in maternal and perinatal outcomes in early- and late-onset preeclampsia across various populations. It is also necessary to investigate the pathophysiological mechanisms underlying the disease, such as placental dysfunction and angiogenic factors, to gain a better understanding of the heterogeneity of the disease. Also, research that assesses predictive models, early-detecting instruments, and risk-specific preventive measures is justified to facilitate the timely detection and risk classification. Studies in resource-constrained environments must also evaluate the effectiveness of interventions and the best management guidelines to minimize negative events and enhance maternal and neonatal health.

CONCLUSIONS

Preeclampsia that is developed at an early stage is linked to worse maternal complications and unfavorable neonatal outcomes than late-onset preeclampsia. The female EO-PE experienced more cases of HELLP syndrome, placental abruption, preterm delivery, low neonatal birth weight, and NICU hospitalization. Early detection and management may be achieved through identification of these risk factors, which include a history of hypertension and an extended period between pregnancies in the family. The critical role of differentiating between EO-PE and LO-PE in clinical practice is certain to minimize poor outcomes in mothers and neonates by careful observation and timely intervention of high-risk pregnancies.

Authors' Contribution

Conceptualization: KF
Methodology: KF, HS, SS
Formal analysis: KF, RJ, FN, HS, SS
Writing and Drafting: KF, RJ, HS
Review and Editing: KF, RJ, FN, HS, SS

All authors approved the final manuscript and take responsibility for the integrity of the work

Conflict of Interest

All the authors declare no conflict of interest.

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