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Original Research Article

NEONATAL OUTCOMES IN PREGNANCIES COMPLICATED BY EARLY ONSET PREECLAMPSIA: A CROSSSECTIONAL OBSERVATIONAL STUDY

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ABSTRACT

Background: Preeclampsia is a multisystem disorder affecting the placenta, kidneys, liver, blood, cardiovascular system, and neurovascular system that only appears during pregnancy. Both mother and fetuse morbidity and mortality are significantly impacted by it. Prematurity, placental insufficiency, fetal growth restriction, and neonatal morbidity are closely related to early-onset preeclampsia, which is described as the disease onset before 34 weeks of gestation. **Materials and Methods:** This cross sectional observational study was conducted in the Department of Obstetrics and gynaecology at a tertiary health care facility in Maharashtra, India, 140 antenatal cases with early onset preeclampsia (EOP) between 20 and less than 34 weeks of gestation who visited the ANC clinic over a 12-month period participated in this observational crosssectional study. All were on regular treatment. Data collection utilized a structured questionnaire that included sociodemographic, investigations, and outcome-related data. Gestational age at delivery, birth weight, Apgar scores, complications, and neonatal mortality were among the neonatal outcomes that were evaluated. SPSS version 28 was employed for the statistical analysis. **Results:** Among the 140 participants, total of 140 (100%)neonatal outcomes were studied. The results show that early-onset preeclampsia was identified as a primary contributor to iatrogenic prematurity, accounting for approximately 117(83.57%)of preterm births. Live birth was observed in 124(88.57%), while stillbirth occurred in 16(11.43%.) Very low birth weight (<1500 g) was seen in 40(28.57%), and 60(42.85%) weighed between 1501-2500 grams. The most common neonatal complications were “intrauterine growth restriction (IUGR)” 56(40%), “respiratory distress syndrome 25(17.85%)”, and “low birth weight 23(16.42%)”. Neonatal mortality was 5(3.57%). **Conclusion:** The findings highlight that early-onset preeclampsia significantly affects neonatal outcomes, primarily due to prematurity and placental dysfunction. Early diagnosis and delivery in tertiary centers with neonatal intensive care facilities are essential to improve survival. Enhanced prenatal surveillance and specialized neonatal support are essential to mitigate the adverse outcomes associated with this condition.

INTRODUCTION

Preeclampsia is defined by an abrupt increase in blood pressure and the presence of protein in the urine after 20 weeks of gestation. Significant blood pressure rise , proteinuria or end-organ damage symptoms are indicators of severe preeclampsia. If proteinuria along with high blood pressure appear before 34 weeks of gestation, then it is is considered as early onset preeclampsia. Hypertension and its complications contribute to nearly 17% of maternal morbidities, making it the third primary cause of maternal mortality.

Preeclampsia and eclampsia persist in causing fatalities among women in developed nations.[1-2] There is an increased risk of acute renal failure, disseminated intravascular coagulation, abruptio placenta, cardiovascular as well as cerebrovascular problems, and maternal mortality. Therefore, early diagnosis and close observation are essential for preventing preeclampsia. When severe preeclampsia develops early, the mother's health gradually deteriorates, and the fetus exhibits high mortality during the perinatal period. The only option to reverse all of these complications is to deliver the fetus.[2-3] Consequently, in cases of foetal discomfort,

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multi-organ failure, or when gestational age attains 34 weeks, the pregnancy must be terminated.

Preeclampsia does not accelerate fetal lung development, but expectant management could negatively impact the mother. Prematurity resulting from early termination, however, leads to significant perinatal morbidity and mortality.[4-6] Consequently, it is essential to weigh the potential risks to the mother against the possible benefits for the fetus.[7-9]

MATERIALS AND METHODS

This cross-sectional observational study had been performed to study neonatal outcomes in instances of early-onset preeclampsia. The study was conducted in the department of obstetrics and gynaecology at Bharati Vidyapeeth (Deemed to be university) Medical college and hospital, Sangli, Maharashtra, India. The study involved 140 antenatal cases between 20 and 34 weeks of gestational age with early onset preeclampsia, who visited the antenatal clinic over a 12-month period. The sample size was established based on studies conducted with a 98% confidence interval, a 2% significance level, and a margin of error of 0.05. The estimated sample size of this study is 136. The "Institutional Ethics Committee of Bharati Vidyapeeth Deemed University Medical College and Hospital, Sangli" (Ref. No: BVDUMC&H/Sangli/IEC/Dissertation2023-24/510) has authorized ethical approval for the study. Informed consents were acquired from the patients and their relatives subsequent to the distribution of information sheets. Antenatal cases qualified for the study were undergoing consistent treatment. All selected patients underwent evaluation, which included history taking, clinical examination, and investigations.

Age, Parity, Booking status of selected cases noted, Blood pressure reading if more than 140/90 mmHg, then 2 readings were taken 4 hours apart, and according to ACOG guidelines [10] mentioned if blood pressure is more than 160/100 mmHg, then 2 readings were taken 15 minutes apart. A urine protein dipstick test was done for the presence of proteinuria. As needed, antihypertensives were given. Complete blood count, liver function, renal function, coagulation profile, fundoscopy, and obstetric ultrasonography were performed on selected cases. All selected cases were monitored until the conclusion of pregnancy. Fetal birth weight and Apgar scores at 0 and 5 min post-delivery were recorded according to modified Apgar scoring system.[11]

Neonatal complications were noted. Participants were selected consecutively based on the established eligibility criteria. Data collection utilized a structured questionnaire that developed by author included both sociodemographic details (such as age and parity), investigations, and regularity of follow-up visits [Appendix]. All prenatal cases with gestational ages between 20 and 34 weeks, systolic and diastolic blood pressure greater than 140/90mmHg (twice, four hours apart), and proteinuria (as determined by a urine dipstick test) or end organ damage were included in the study. Additional instances of chronic hypertension with underlying medical conditions and gestational ages of 20 weeks or less and more than 34 weeks.

Additionally, patients who refused to participate in the study or refused to gave their consent were not allowed to participate. The data was analyzed with the help of "IBM SPSS Statistics for Windows, Version 20.0 (released 2011, IBM Corp., Armonk, NY)"

RESULTS

The age demographics of the research participants indicate that the majority of individuals affected by early-onset preeclampsia belong to the 20-29 age group, comprising 94(67.14%) of the total cases. The 30-35 age demographic constitutes 28(20%)of the cases. The age category of 19 years or younger comprises the smallest proportion, contributing merely 5(3.57%) of the participants, whereas the age group beyond 35 years constitutes 13(9.29%). This indicates that early-onset preeclampsia is more common among women of reproductive age (20-35 years), with a markedly reduced incidence in adolescents and older women. [Table 1]

The parity distribution of the study participants reveals that a slightly higher proportion of women with early onset preeclampsia are multiparous 72(51.43%) compared to primiparous women 68 (48.57%). This indicates that both women with prior pregnancies and those experiencing their first pregnancy are equally susceptible to early-onset preeclampsia, with a marginally higher frequency in multiparous women. [Table 2]

The booking status of the study participants shows a significant majority of women with early-onset preeclampsia had been unbooked 101(72.14%), meaning they did not seek prenatal care or register with a healthcare provider early in pregnancy. In contrast, only 39(27.86%) of the participants were booked, indicating that a smaller proportion of women sought timely prenatal care. This suggests that late or insufficient prenatal care may be a contributing factor in the development or exacerbation of early-onset preeclampsia. [Table 3]

The conception method distribution among participants with early-onset preeclampsia indicates that the majority of pregnancies 105(75%) were spontaneous. A smaller proportion of women conceived through ovulation induction 18(12.86%) and in vitro fertilization (IVF)17 (12.14%). This suggests that while assisted reproductive technologies contribute to some cases of early-onset preeclampsia, spontaneous pregnancies still account for the majority of such cases. [Table 4]

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The gestational age at delivery for participants with early-onset preeclampsia indicates that the majority of pregnancies resulted in preterm deliveries 117 (83.57%), highlighting the increased risk of preterm birth associated with this condition. Only 23(16.43%) of deliveries occurred at full term, indicating that early onset preeclampsia is commonly linked to premature birth, which can pose additional risks to both maternal and fetal health. [Table 6]

The mode of delivery data for participants with early-onset preeclampsia shows that the majority of deliveries were through emergency cesarean section 104(74.29%), reflecting the higher risks and complications associated with this condition. Elective cesarean sections accounted for 17(12.14%) of deliveries, while vaginal deliveries were relatively less common, occurring in 19(13.57%) of cases. This suggests that early onset preeclampsia frequently necessitates cesarean deliveries, often due to maternal or fetal distress. [Table 7]

The outcome of pregnancy for participants with early-onset preeclampsia shows that the majority of cases resulted in live births 124(88.57%), which is a positive outcome despite the high risk associated with this condition. However, 16(11.43%) of the pregnancies ended in stillbirth, indicating a significant risk to fetal survival in cases of early-onset preeclampsia. This highlights the need for timely intervention and monitoring to improve fetal outcomes in such pregnancies. [Table 8]

Neonatal status was assessed using the modified Apgar score.[11] The Apgar score data at 1 minute and 5 minutes show that, at 1 minute, the majority of newborns with early onset preeclampsia had a score between 8 and 10 106(75.72%), indicating generally good immediate post-birth health. However, 34(24.28%) of the newborns had a score between 5 and 7, indicating some initial respiratory or circulatory distress. By 5 minutes, the majority of newborns 111(79.28%) had a score between 8 and 10, reflecting improvement, while 29(20.72%)continued to have a score between 5 and 7, suggesting a need for continued monitoring and possible medical intervention. [Table 9]

The birthweight distribution of newborns in early onset preeclampsia reveals that the majority of infants had a birth weight between 1501 and 2500 grams 60 (42.85%). A notable proportion of babies were born with low birth weight (<1500 grams), accounting for 40(28.57%), indicating a significant risk of growth restriction associated with this condition. The remaining infants had birth weights between 2501 and 3500 grams

38(27.14%), while only 2(1.42%)infants (a very small proportion) weighed more than 3500 grams, indicating that macrosomia is rare in this population. [Table 10]

Fetal complications in early-onset preeclampsia show a high incidence of IUGR, which occurred in 56(40%)of cases, reflecting the risk of restricted fetal growth in such pregnancies. Respiratory distress syndrome 25(17.85%) and low birth weight 23(16.42%) were also common. Other complications included septicemia 12(8.57%), hypoxic ischemic encephalopathy 3(2.14%), and intrauterine death 15(10.71%). Neonatal death was observed in 5(3.57%)of cases, and 1(0.71%) of infant was born healthy. These findings highlight the significant risks to fetal health, including the potential for serious neonatal morbidity and mortality. [Table 11]

Table 1: Age Distribution of Participants with Early-Onset Preeclampsia

Age(years)	Frequency	Percent
18-19	5	3.57
20-29	94	67.14
30-35	28	20
>35	13	9.29
Total	140	100

Table 2: Parity Distribution of Participants with Early-Onset Preeclampsia

Parity	Frequency	Percent
Multiparous	72	51.43
Primiparous	68	48.57
Total	140	100

Table 3: Booking Status of Participants with Early Onset Preeclampsia

Booking status	Frequency	Percent
Booked	39	27.86
Unbooked	101	72.14
Total	140	100

Table 4: Conception Method of Participants with Early Onset Preeclampsia

Conception	Frequency	Percent
IVF conception	17	12.14
Ovulation induction	18	12.86
Spontaneous	105	75.00
Total	140	100

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Table 5: Gestational Age at Diagnosis of Early Onset Preeclampsia

Gestational age at diagnosis	Frequency	Percent
24-28	14	10.00
29-32	112	80.00
33-34	14	10.00
Total	140	100

Table 6: Gestational Age at Delivery in Participants with Early Onset Preeclampsia

Gestational_age_at_delivery	Frequency	Percent
Pre term	117	83.57
Term	23	16.43
Total	140	100

Table 7: Mode of Delivery in Participants with Early-Onset Preeclampsia

Mode_of_delivery	Frequency	Percent
Elective Lscs	17	12.14
Emergency Lscs	104	74.29
Vaginal delivery	19	13.57
Total	140	100

Table 8: Live or Stillbirth Outcome in Participants with Early Onset Preeclampsia

Live or stillbirth	No of cases	Percentage (%)
Live	124	88.57
Still birth	16	11.43
Total	140	100

Table 9: Apgar Score at 1 Minute and 5 Minutes in Newborns with Early Onset Preeclampsia

Apgar Score	At 1 minute		At 5 minutes	
	Frequency	Percent	Frequency	Percent
5-7	34	24.28	29	20.72
8-10	106	75.72	111	79.28
Total	140	100	140	100

Table 10: Birthweight Distribution in Newborns with Early Onset Preeclampsia

Birthweight_grams	Frequency	Percent
<1500	40	28.57
1501 – 2500	60	42.85
2501 – 3500	38	27.14
> 3500	2	1.42
Total	140	100

Table 11: Fetal Complications in Participants with Early-Onset Preeclampsia

Fetal complications	No of cases	Percentage (%)
IUGR	56	40
Low birth weight	23	16.42
Respiratory distress syndrome	25	17.85
Septicemia	12	8.57
Hypoxic ischemic encephalopathy	3	2.14
Intrauterine death	15	10.71
Neonatal death	5	3.57
healthy	1	0.71
Total	140	100

DISCUSSION

This study examines fetal outcomes in early-onset preeclampsia patients by age, parity, gestational age at diagnosis, and mode of delivery. This research aims to identify earlyonset preeclampsia and its effects on neonates. The study is to evaluate the efficacy of early diagnosis, prompt intervention, and suitable management options in enhancing outcomes for their infants. The ability of this study to lead clinical procedures and public health policy for the treatment of early-onset preeclampsia is what makes it significant. Understanding the risk factors and outcomes is crucial for developing targeted therapies to reduce the significant incidence of serious issues associated with this illness, such as preterm delivery, intrauterine growth restriction, and newborn mortality. The results will enhance prenatal care procedures, highlighting the necessity of early screening for highrisk women, particularly those with comorbidities including hypertension, diabetes, and obesity. The work is crucial for informing the creation of screening recommendations for early onset preeclampsia, facilitating earlier intervention to enhance foetal survival rates. This research will enhance the existing evidence concerning the long-

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term impacts of early onset preeclampsia on maternal health, aiding in the continuous efforts to improve patient treatment and decrease pregnancy-related mortality. The findings of this study could improve the quality of treatment for fetal health in general by improving clinical outcomes and healthcare delivery for women with early-onset preeclampsia. The majority of women 94(67.14%) with early-onset preeclampsia were between the ages of 20 and 29, according to the study's participant age distribution. The 30-35 years age group accounted for 28(20%) of cases, while 13(9.29%)were individuals over 35 years, and the least afflicted were those under 19 years, representing only 5(3.57%)of cases. [Table 1] This finding corresponds with the observations of Divyaradha KS et al. (2014),[12] who indicated that EOP is primarily diagnosed in women between 24-34 weeks of gestation, particularly among those aged 20-35 years. The typical gestational age at diagnosis was recorded as 31 weeks, with most women terminating their pregnancies after 32 weeks due to maternal problems such as imminent eclampsia. Conversely, Sibai BM (1994),[13] showed that younger women (under 30) are more predisposed to experiencing preeclampsia at an earlier stage in their pregnancies. The study confirmed our findings that younger mothers (20-29 years) had the most problems.

The parity distribution in the present study indicated that 72 (51.43%) of individuals were multiparous, whereas 68(48.57%)were primiparous. The data indicate that early-onset preeclampsia impacts both women with prior pregnancies and those undergoing their initial pregnancy. This distribution illustrates the findings of Elveđi-Gašparović V et al. (2015),[14] which indicated that both primigravidas and multigravidas are susceptible to early onset preeclampsia. Their research identified primiparity as a significant antenatal risk factor for early onset preeclampsia, with an odds ratio (OR) of 2.39 for the condition's occurrence infirst-time mothers. Wadhwani P et al. (2020),[15] found no significant difference in early onset preeclampsia rates between primiparous and multiparous women, indicating that factors beyond parity, such as age and health conditions, may play a more substantial role in the condition's development. Thus, while primiparity is a significant factor, this study reveals that early-onset preeclampsia is not confined to first-time mothers and may also affect those with previous pregnancies. [Table 2]

The study observed a high proportion 101(72.14%) of unbooked pregnancies, meaning that these women did not seek prenatal care or register with healthcare providers early in their pregnancy. This is an important finding because early-onset preeclampsia is significantly more likely to develop and worsen if early prenatal care is not received. [Table 3] The elevated proportion of unbooked cases in this study corresponds with the observations of Ikeanyi E (2020),[16] who indicated that delayed or insufficient prenatal care leads to adverse outcomes for both the mother and the fetus. Highlighted the significance of prompt prenatal care, especially during early gestation, to reduce the likelihood of complications like preeclampsia. This study emphasizes the critical necessity for healthcare systems to promote early registration and prenatal consultations, particularly for high-risk pregnancies, to decrease the incidence and severity of early-onset preeclampsia. The study found that 105(75%) of pregnancies in women with Early onset preeclampsia were spontaneous, followed by 18(12.86%)conceived via ovulation induction and 17(12.14%)via in vitro fertilization (IVF). This finding indicates that, although assisted reproductive technologies correlate with a higher incidence of complications like preeclampsia, the majority of cases still develop in spontaneously conceived pregnancies. This is supported by Iacobelli S et al. (2017),[17] who found that assisted reproductive technologies (ART), including IVF, contribute to a higher risk of preeclampsia, but the majority of cases were spontaneous. [Table 4] The majority of cases in this study were diagnosed between 29-32 weeks of gestation 112(80%), which is consistent with the typical gestational age at which early onset preeclampsia is diagnosed. [Table 5] Also, the study found that 117(83.57%)of the participants delivered preterm, while only 23(16.43%)delivered at full term. This is consistent with the results of Biswas D et al.(2020),[18] which showed that 88% of deliveries in women with EOP occurred before 37 weeks of gestation, making preterm delivery the most common outcome. Preterm delivery is a recognized risk factor for neonatal complications, including intraventricular haemorrhage and respiratory distress syndrome, frequently observed in neonates born to mothers with EOP. [Table 6] Similarly, Teka H et al. (2023),[19] observed that early-onset preeclampsia is strongly related to preterm delivery, with 87% of deliveries occurring before 37 weeks. This study also emphasized that preterm births were often necessary due to maternal or fetal distress, including severe hypertension, eclampsia, and fetal growth restriction. This study's elevated incidence of preterm delivery underscores the necessity for prompt identification and timely intervention to prevent maternal and neonatal morbidity and mortality.

In this study, 104(74.29%)of women with early-onset preeclampsia had emergency cesarean sections, 17(12.14%) elective ones, and 19(13.57%) vaginal deliveries. Teka H et al. (2023),[19] stated that cesarean delivery is frequently necessary in cases of early-onset preeclampsia due to increased risks of maternal and fetal complications. This data indicates that cesarean section is the predominant and essential intervention for women with earlyonset preeclampsia due to the associated risks. [Table 7] In this research, the live birth rate was 124(88.8%) while stillbirth occurred in 16 (11.18%)of cases. The findings of Teka H et al. (2023),[19] indicate that stillbirth rates were markedly elevated in women with early onset preeclampsia, with 10-15% of cases resulting in

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stillbirth, predominantly attributed to placental insufficiency and fetal distress. The elevated stillbirth rate in our study is likely attributable to severe placental insufficiency, intrauterine growth restriction (IUGR), and preterm birth, which are prevalent consequences of early-onset preeclampsia. These findings underline the importance of timely intervention and monitoring to improve fetal survival in pregnancies affected by early-onset preeclampsia. [Table 8]

In our study, Neonatal status was assessed using the modified Apgar score.[11] The Apgar score data at 1 minute revealed that 106(75.72%) of newborns scored between 8 and 10, indicating good immediate post-birth health. However, 34(24.28%) scored between 5 and 7, indicating some initial distress. By 5 minutes, 111(79.28%)of the newborns scored between 8 and 10, reflecting an improvement in their health. Ikeanyi E et al.(2020),[16] emphasized the significant correlation between low Apgar scores and negative neonatal outcomes, including neonatal mortality and respiratory distress syndrome. [Table 9] According to this study, 52(34.21%) of neonates born to mothers with EOP weighed less than 1500 grams, 40(28.57%)weighed between 2501 and 3500 grams, and 60(42.85%) weighed between 1501 and 2500 grams. The findings align with Wadhwani P et al. (2020),[15] who indicated a strong correlation between early onset preeclampsia and low birth weight (LBW). Their study revealed that IUGR occurred in 40% of cases, resulting in a significant percentage of infants being born weighing less than 2500 grams. Ikeanyi E et al. (2020),[16] found 28.8% of early-onset preeclampsia infants were small for gestational age. Preeclampsia increases IUGR and low birth weight. Due to placental insufficiency, infants born to women with early-onset preeclampsia had lower birth weights, according to Biswas D et al (2020).[18] These findings underscore the correlation between early-onset preeclampsia and impaired fetal growth, highlighting the necessity for careful monitoring of fetal development throughout pregnancy. [Table 10]

The neonatal complications observed in this study were significant, with 56(40%)of infants experiencing intrauterine growth restriction (IUGR), 25(17.85%) having respiratory distress syndrome (RDS), and 15(10.71%) experiencing intrauterine death (IUD). The results agree with the findings of Ikeanyi E et al. (2020),[16] who similarly found a significant prevalence of IUGR (28.8%) and RDS (30%) in neonates born to mothers with early onset preeclampsia. Wadhwani P et al. (2020),[15] reported a markedly elevated incidence of neonatal mortality in cases of early onset preeclampsia, with fetal demise predominantly attributed to fetal distress and placental insufficiency. They observed a 6.82 times increase in the odds of neonatal death in early-onset preeclampsia relative to late onset, further substantiating the heightened neonatal morbidity and mortality related to this condition. The results highlight the significant risks to fetal health associated with earlyonset preeclampsia, particularly the increased risk of "respiratory distress syndrome (RDS)", "intrauterine growth restriction (IUGR)", and neonatal mortality. This highlights the need for close monitoring and timely intervention to improve outcomes. [Table 11] The newborn mortality rate in this study was 5(3.57%) while the incidence of intrauterine death (IUD) was 15(10.71%) of pregnancies. The results align with Teka H etal. (2023) [19], which indicated that the infant mortality rate in early onset preeclampsia was markedly elevated in comparison to late onset preeclampsia. They noted that infant mortality was especially elevated among women identified prior to 34 weeks of gestation, with foetal growth restriction (FGR) exacerbating the adverse consequences. [Table 11]

Limitations

This study possesses specific limitations. This was a single-center observational study that did not evaluate long-term neurodevelopmental outcomes. It is advisable to conduct larger multicentric studies.

CONCLUSION

Early-onset preeclampsia significantly compromises neonatal outcomes due to prematurity and placental insufficiency. Reducing morbidity and mortality requires strengthening prenatal surveillance and making sure that deliveries take place in facilities with cutting-edge neonatal care capabilities. Overall, as early-onset preeclampsia is linked to considerable fetal morbidity and mortality, this study emphasizes the vital need for early detection and intervention. The risks of this serious condition can be reduced, and maternal and neonatal outcomes can be improved with early screening and diagnosis, appropriate medical management, prompt delivery at tertiary care centres with neonatal intensive care units and multidisciplinary approach.

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Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Institutional ethics committee, Bharati university Deemed to be medical college and hospital, sangli issued approval 510. This study was approved by the Institutional Ethics Committee of [Bharati university Deemed to be medical college and hospital, sangli] (Approval No: 510). Written informed consent was obtained from all participants prior to enrollment. The study was conducted in accordance with the principles of the Declaration of Helsinki. Animal subjects: All authors have confirmed that this study did not involve animal subjects or tissue.

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