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Frequency of Adverse outcomes after Induction of Labor by Intracervical Catheterization with Prostaglandin Tablet in Eclamptic Patients in Mardan Medical Complex

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ABSTRACT

Background: Eclampsia is a life-threatening hypertensive disorder complicating pregnancy and causing extensive maternal and neonatal morbidity. Induction of labour in such patients poses clinical difficulties in mode of delivery as well as neonatal outcome. Intracervical catheterization with supplementary prostaglandin therapy has been widely used, though results by this method have been sparse in local practice. **Objective:** To determine the frequency of adverse outcomes after induction of labour by intracervical catheterization with prostaglandin tablet in eclamptic patients in Mardan Medical Complex. **Study Design:** Descriptive cross-sectional study. **Duration and Place of Study:** The study was conducted from January to July 2024 at the Department of Obstetrics and Gynaecology, Mardan Medical Complex, Mardan. **Methodology:** A total of 172 eclamptic women aged 18–40 years, with singleton pregnancies beyond 36 weeks of gestation, were enrolled using non-probability consecutive sampling. Labor induction was initiated with a No. 16 Foley catheter and 50 micrograms of vaginal misoprostol, with repeated doses administered as needed. The catheter was removed after 12 hours or earlier based on labor progression or fetal condition. Cesarean section and neonatal death (within 72 hours of birth) were recorded as primary outcomes. **Results:** The mean maternal age was 29.49 ± 6.72 years, and mean gestational age at delivery was 38.71 ± 1.68 weeks. Cesarean section occurred in 47.1% of cases, while early neonatal death was observed in 5.2%. Cesarean delivery was significantly associated with higher parity (p=0.005), while neonatal death showed a higher, though statistically non-significant, trend in older mothers and post-term pregnancies. **Conclusion:** Labor induction using intracervical catheterization in eclamptic patients is associated with a high rate of cesarean delivery and a modest risk of neonatal death.

INTRODUCTION

Eclampsia is a life-threatening complication in women with preeclampsia, occurring when generalized tonic-clonic seizures develop in a preeclamptic patient.[1] It typically occurs after 20 weeks' gestational age, though it can also occur during labor or after delivery.[2] Widespread endothelial dysfunction, cerebral edema, and vasospasm are part of the pathology, culminating in seizure activity.[3] In spite of advances in antenatal care, eclampsia itself is still a leading cause of maternal and perinatal morbidity and mortality, particularly in low-resource settings.[4] Diagnosis in the early stage, with immediate treatment, is crucial in preventing adverse outcomes, including intracranial hemorrhage, renal impairment, and pulmonary edema.[5]

In eclampsia, decision for delivery plays an important role in stabilizing the mother as well as in recovery.[1] Spontaneous labor is generally induced, with the condition being favorable for the cervix, without immediate cesarean section urgency.[6] However, patients with eclampsia present a unique challenge since, beyond being in a physiologically compromised state, there is an increased risk for any complication such as placental abruption, fetal distress, and coagulopathy.[7] Careful consideration must go into the timing, including modality, of induction, considering the urgency for delivery versus the risk for the mother and fetus.[8] In the treatment of these high-risk patients, multidisciplinary care with teamwork among obstetricians, anesthesiologists, and neonatologists serves to optimize outcomes in complicated cases.

One method utilized for the induction of labor in eclamptic patients is intracervical catheterization with prostaglandin tablet insertion.[9] It attempts a controlled induction of cervical ripening, with the onset of uterine contractions.[9] Acting synergistically, the mechanical effect of the catheter, as well as the pharmacologic action of the

prostaglandins, attempts cervical softening in preparation for labor.[10] It is viewed as a less aggressive intervention than oxytocin augmentation or surgery and may offer advantages in cervical favorability, in addition to patient tolerability.[11] However, its efficacy, with a corresponding safety profile, must be evaluated stringently, particularly in the high-risk obstetric populations, including patients with eclampsia.

Despite the promise, labor induction with intracervical catheterization with prostaglandin tablets in eclamptic women has definite adverse consequences. Emergency cesarean section rate remains relatively high,[11] frequently due to failed induction or non-reassuring patterns of fetal heart rate. Again, neonatal mortality risk is also elevated in this group, owing in part to prematurity, intrauterine growth retardation, and perinatal asphyxia.[12] Such problems necessitate extreme intrapartum monitoring with operative delivery readiness, an absolute necessity. Universal risk assessment, individualized care planning, and intensive intrapartum monitoring are therefore critical in forestalling these adverse consequences and maximizing maternal and neonatal outcomes.

A study conducted by Jangra H et al. reported a cesarean section rate of 37.5% and a neonatal mortality rate of 4.2% following induction of labor using intracervical catheterization in patients with eclampsia.[13]

This local study in Mardan is essential because very limited area-based data are available on the maternal and neonatal outcomes following induction of labor in eclamptic patients with intracervical catheterization by prostaglandin tablets. Since eclampsia is a high-risk condition with non-uniform clinical practice among various health facilities, a local evaluation of adverse outcomes will refine obstetric care practice, provide intervention in a timely manner, and potentially reduce maternal and neonatal morbidity and mortality within the area.

METHODOLOGY

This descriptive study was conducted from January until July 2024, in the Department of Obstetrics and Gynaecology at the Mardan Medical Complex, Mardan. A non-probability consecutive sampling was utilized through which 172 women diagnosed with eclampsia were included. The sample size was calculated using WHO software, considering a 95% confidence level, a 3% margin of error, and an expected frequency of neonatal death of 4.2% following labor induction through intracervical catheterization in patients with eclampsia.[13]

Women 18-40 years old with singleton pregnancy documented by ultrasound, gestational age more than 36 weeks according to the last menstrual period, and meeting the clinical definition of eclampsia—all the above criteria plus preeclampsia plus one or more generalized tonic-clonic seizures in pregnancy or in the first week after giving birth—were included in the study. Preeclampsia was diagnosed by the presence of hypertension more than 140/90 mmHg and proteinuria more than 300 mg in 24 hours. Exclusion criteria included the presence of a previous intrauterine infection, scar in the uterus, chronic systemic disease like diabetes, cardiovascular disease or renal disease, or asthma, or the finding on ultrasound of macrosomia in the fetus, polyhydramnios, abnormal presentation, or placenta previa. Ethical clearance was granted before the commencement of the study, and written informed consent was from all patients/participants or from the parent or guardian with the assurance of confidentiality and absence of risk to the patient.

Baseline demographic and clinical data were recorded, including maternal age, gestational age, parity, body mass index (BMI), diabetic history, and residential location. Labor induction was initiated by inserting a No. 16 Foley catheter into the cervical canal under direct visualization with a sterile speculum. The balloon was inflated with 60 mL of normal saline and secured with gentle traction against the internal os. Simultaneously, a 50 microgram dose of misoprostol was inserted into the posterior vaginal fornix. Cardiotocography (CTG) was performed one hour after the procedure to assess fetal wellbeing. A reassessment was done after six hours to evaluate the presence of uterine contractions and improvement in cervical status using the Bishop score. If contractions were not palpable and the Bishop score remained six or below, and the fetal heart rate pattern remained normal, a second dose of 50 micrograms of misoprostol was administered. This cycle of evaluation and intervention was repeated after another six hours.

The catheter was removed at the 12-hour mark, regardless of cervical response, and a third dose of misoprostol was given if required. If the patient entered active labor at any point during the induction protocol, labor was managed as per standard institutional guidelines. The catheter was also removed if fetal heart rate patterns became non-reassuring or if rupture of membranes occurred. Emergency cesarean delivery was performed in the presence of pathological fetal heart tracings or if meconium-stained amniotic fluid was observed during labor. Each woman was followed until delivery to observe the outcomes.

Mode of delivery and early neonatal outcomes were recorded. Cesarean section was defined as surgical delivery through a transverse lower abdominal incision. Neonatal death was considered when death occurred within 72 hours of birth. Data collection was documented in a pre-designed proforma.

Data analysis was performed using IBM SPSS version 26. Quantitative variables were summarized using mean ± standard deviation. Categorical data were presented as frequencies and percentages. Stratification was performed for potential confounders including maternal age, gestational age, parity, BMI, diabetes, and residential status. Post-stratification analysis was conducted using chi-square tests, and a p-value of ≤0.05 was considered statistically significant.

RESULTS

The mean maternal age was 29.49±6.72 years, with a gestational age of 38.71±1.68 weeks at delivery. The average parity was 2.24±1.44, and the mean BMI was 26.70±4.78 kg/m^2. Regarding comorbidities, diabetes mellitus was present in 21 patients (12.2%), while the majority (151 patients, 87.8%) were non-diabetic. The

residential distribution showed a nearly equal split between rural (88 patients, 51.2%) and urban (84 patients, 48.8%) populations (as shown in Table-I).

Table I

Patient Demographics

Demographics	Mean ± SD
Age (years)	29.49±6.72
Gestational Age (weeks)	38.71±1.68
Parity	2.24±1.44
BMI (kg/m^2)	26.70±4.78
Diabetes	
Yes n (%)	21 (12.2%)
No n (%)	151 (87.8%)
Residential Status	
Rural n (%)	88 (51.2%)
Urban n (%)	84 (48.8%)

The frequency analysis revealed that cesarean section was the most common adverse outcome, occurring in 81 patients (47.1%), while neonatal death occurred in 9 cases (5.2%) (as shown in Table-II).

Table II

Frequency of Adverse Outcomes after Induction of Labor

Adverse Outcomes	Frequency	% age
C-Section	81	47.10%
Neonatal Death	9	5.20%

Age stratification showed that younger mothers (≤30 years) had a cesarean rate of 44.1% (41/93) compared to 50.6% (40/79) in older mothers (>30 years), though this difference was not statistically significant (p=0.391). For neonatal mortality, older mothers demonstrated a higher rate at 8.9% (7/79) versus 2.2% (2/93) in younger mothers, approaching statistical significance (p=0.082). Gestational age analysis revealed similar cesarean rates between groups: 47.9% (45/94) for pregnancies ≤39 weeks versus 46.2% (36/78) for those >39 weeks (p=0.822). However, neonatal death rates were notably higher in post-term pregnancies >39 weeks at 9.0% (7/78) compared to 2.1% (2/94) in pregnancies ≤39 weeks, trending toward significance (p=0.081). Parity demonstrated the most significant association with cesarean delivery, where grand multiparous women (>3 deliveries) experienced substantially higher cesarean rates at 67.6% (25/37) compared to 41.5% (56/135) in women with ≤3 deliveries (p=0.005). Conversely, neonatal mortality was higher in the grand multiparous group at 10.8% (4/37) versus 3.7% (5/135), though not reaching statistical significance (p=0.101). BMI stratification showed minimal differences in both outcomes, with cesarean rates of 51.4% (38/74) in normal BMI (≤25 kg/m^2) versus 43.9% (43/98) in overweight patients (>25 kg/m^2) (p=0.331), and nearly identical neonatal death rates of 5.4% versus 5.1% respectively (p=1.000). Diabetes mellitus demonstrated a paradoxical protective effect against cesarean delivery, with diabetic patients having significantly lower cesarean rates at 23.8% (5/21) compared to 50.3% (76/151) in non-diabetic patients (p=0.034). Remarkably, no neonatal deaths occurred among diabetic mothers (0/21, 0.0%) compared to 6.0% (9/151) in non-diabetic patients, though this difference was not statistically significant (p=0.382). Residential status showed minimal impact on outcomes, with rural patients having cesarean and neonatal death rates of 47.7% (42/88) and 4.5% (4/88) respectively, compared to urban patients at 46.4% (39/84) and 6.0% (5/84), with no significant differences (p=0.865 and p=0.742 respectively) (as shown in Table-III).

Table III

Association of Adverse Outcomes with Demographic Factors

Demographic Factors		C-Section		p-value	Neonatal Death		p-value
		Yes n(%)	No n(%)		Yes n(%)	No n(%)	
Age (years)	≤30	41 (44.1%)	52 (55.9%)	0.391	2 (2.2%)	91 (97.8%)	0.082*
	>30	40 (50.6%)	39 (49.4%)		7 (8.9%)	72 (91.1%)	
Gestational Age (weeks)	≤39	45 (47.9%)	49 (52.1%)	0.822	2 (2.1%)	92 (97.9%)	0.081*
	>39	36 (46.2%)	42 (53.8%)		7 (9.0%)	71 (91.0%)	
Parity	≤3	56 (41.5%)	79 (58.5%)	0.005	5 (3.7%)	130 (96.3%)	0.101*
	>3	25 (67.6%)	12 (32.4%)		4 (10.8%)	33 (89.2%)	
BMI (Kg/m^2)	≤25	38 (51.4%)	36 (48.6%)	0.331	4 (5.4%)	70 (94.6%)	1.000*
	>25	43 (43.9%)	55 (56.1%)		5 (5.1%)	93 (94.9%)	
Diabetes	Yes	5 (23.8%)	16 (76.2%)	0.034	0 (0.0%)	21 (100.0%)	0.382*
	No	76 (50.3%)	75 (49.7%)		9 (6.0%)	142 (94.0%)	
Residential Status	Rural	42 (47.7%)	46 (52.3%)	0.865	4 (4.5%)	84 (95.5%)	0.742*
	Urban	39 (46.4%)	45 (53.6%)		5 (6.0%)	79 (94.0%)	

*Fischer Exact Test

DISCUSSION

Our findings demonstrate a cesarean section rate of 47.1% and neonatal mortality rate of 5.2%, indicating substantial morbidity in this high-risk population. The significantly higher cesarean rates observed in grand multiparous women (67.6% vs 41.5%, p=0.005) can be attributed to uterine dysfunction and decreased contractility following multiple pregnancies, leading to cervical scarring, altered uterine muscle fiber orientation, and reduced responsiveness to prostaglandin stimulation. The trend toward higher neonatal mortality in mothers >30 years (8.9% vs 2.2%) is consistent with age-related placental insufficiency, increased comorbidities, and diminished physiological reserves that compromise fetal tolerance to labor stress in the setting of pre-existing eclampsia. Similarly, the elevated neonatal death rates in post-term pregnancies >39 weeks (9.0% vs 2.1%) likely reflect progressive placental aging, oligohydramnios, and fetal macrosomia, which collectively increase perinatal complications when superimposed on the already compromised uteroplacental circulation characteristic of eclampsia. The absence of significant associations with BMI and residential status suggests that the severity of eclampsia and its management may overshadow these

demographic factors in determining immediate perinatal outcomes.

When comparing our findings with existing literature, several important similarities and differences emerge. Our cesarean section rate of 47.1% in eclamptic patients is notably higher than rates reported in studies involving less severe hypertensive conditions. Bakhsh et al. [14] demonstrated that planned induction in gestational hypertension resulted in cesarean rates of 27.5% versus 45% with expectant management, suggesting that early intervention in milder hypertensive disorders may reduce surgical delivery rates. Similarly, Kaur et al. [15] reported cesarean rates of 15.8% with Foley catheter and 20.6% with PGE2 gel in mixed indications including preeclampsia, while Rana et al. [16] found rates of 20.3% and 25% respectively. The substantially higher cesarean rate in our study likely reflects the severity of eclampsia compared to gestational hypertension or preeclampsia, where urgent delivery is often necessary regardless of induction method due to maternal and fetal safety concerns.

The maternal age distribution in our study (mean 29.49±6.72 years) aligns closely with Rana et al. [16] who reported a mean age of 27.15±5.5 years, and Habib et al. [17] with ages of 28.6±6.2 and 29.2±6.2 years in their comparative groups. However, our age-related cesarean outcomes differ from typical patterns, showing non-significant differences between younger and older mothers (44.1% vs 50.6%), which may be attributed to the overriding clinical urgency in eclamptic patients superseding age-related factors. The neonatal mortality rate of 5.2% in our study represents a concerning finding that was not extensively reported in the comparison studies, likely because most previous research focused on less severe hypertensive conditions where neonatal outcomes are generally more favorable.

Our gestational age findings (mean 38.71±1.68 weeks) are comparable to term pregnancies studied by Bakhsh et al. [14] at 37-40 weeks, Kaur et al. [15] at ≥37 weeks, and Rana et al. [16] at term. However, the higher neonatal death rates in post-term pregnancies >39 weeks (9.0% vs 2.1%) in our eclamptic population contrasts with Habib et al. [17] who studied post-dated pregnancies ≥41 weeks without reporting significant neonatal mortality, emphasizing that eclampsia adds substantial risk beyond gestational age considerations alone.

Methodologically, our study differs significantly from the comparison studies in patient population severity. While Mundle et al. [18] Kaur et al. [15] Rana et al. [16] and Habib et al. [17] compared different induction methods in various obstetric conditions, our focus on eclamptic patients represents a higher-risk population where the primary goal shifts from method comparison to outcome assessment in emergency situations. The mean induction-to-delivery intervals reported by Kaur et al. [15] (15.20±4.53 vs 15.86±4.79 hours) and Rana et al. [16] (17.31±7.19 vs 15.77±7.37 hours) provide benchmarks, though these may not be directly applicable to eclamptic patients where delivery urgency often supersedes prolonged induction attempts.

The cost-effectiveness advantages of Foley catheter demonstrated by Rana et al. [16] (Rs 256 vs Rs 1,500) support the economic rationale for mechanical induction methods, particularly relevant in resource-limited settings where eclampsia management requires optimal resource utilization. Singh et al. [19] concluded that method choice should be individualized, which is particularly pertinent in eclamptic patients where safety considerations may outweigh efficacy in terms of induction speed. The absence of serious maternal complications reported by several studies [15-17] contrasts with the inherent high-risk nature of eclamptic pregnancies in our population, where maternal and neonatal morbidity remain significant concerns regardless of induction method employed.

Certain limitations should be recognized in the interpretation of these findings. The study was a center study conducted in a lone tertiary care center and may limit the generalizability within other healthcare settings with different resources, protocols, or patient populations. The relatively modest patient population size of 172 patients was adequate for pilot analysis but may have limited statistical power in identifying smaller but clinically significant differences between groups for rare outcomes like neonatal mortality. Furthermore, the study had no control group comprised of patients with eclampsia treated with alternative methods of inducing labor or expectant management, limiting comparative analysis between the efficacy and safety of the combined intracervical catheter and prostaglandin approach.

CONCLUSION

Our study has identified cesarean section as the most frequent unfavorable outcome subsequent to acceleration of labour by intracervical catheterization in conjunction with prostaglandin tablets in patients with eclampsia, observed in near half the populations examined. Neonatal mortality although less common is nonetheless a cause for concern in this population at risk. Parity was identified as the most potent predictor of cesarean delivery from the analysis performed with grand multiparous women having significantly higher surgical delivery rates.

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