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Neonatal Outcomes Of Preeclampsia With Clinicopathological Correlation

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Abstract

Introduction

Preeclampsia accounts for of all 5- 8% of pregnancies and is a major cause of maternal and neonatal morbidity and mortality. Neonatal morbidity is due to preeclampsia as well as due to uteroplacental insufficiency including fetal growth restriction (FGR), fetal death and stillbirths. Also morbidity in neonates is due to prematurity attributed to early termination of pregnancy including respiratory morbidities, which is confounded by in-utero hypoxia due to Pregnancy Induced Hypertension (PIH).

Materials And Methods

The study was conducted as a prospective study in JIPMER with preeclamptic women (n = 53), diagnosed by American College of Obstetrics and Gynaecology (ACOG) criteria and control group (n=53). Data were collected for neonatal outcomes including birth weight, gestational age, fetal deaths or stillbirths.

Results:

The mean birth weight of neonates born to mothers with pre-eclampsia (2000 □ 670) is higher than control group (2770 □ 380) ($p < 0.001$). The mean gestational age of babies is less in preeclamptic women (36.39 □ 3.45) than control group (39.27 □1.08) ($p < 0.001$). There were fetal deaths or stillbirths in preeclamptic group, whereas there were no deaths in control group women ($P = 0.02$).

Conclusion:

There is a significant increase in the adverse of neonates born to preeclamptic women compared with control group. The poor outcomes include prematurity, low birth weight and fetal demise or stillbirth.

Keywords: preeclampsia, intrauterine growth retardation, prematurity, gestational age

Introduction

Preeclampsia accounts for 5-8% of pregnancies beyond 20 weeks of gestation, with severe preeclampsia accounting for <1% of pregnancies and eclampsia accounting for 0.1% of pregnancies (1). Mild pre-eclampsia is defined as systolic blood pressure of >140 mm Hg and diastolic blood pressure > 90mm Hg with proteinuria <0.3g/day (2). Severe preeclampsia is defined as blood pressure 160mm Hg systolic or 110 mm Hg diastolic or symptoms suggestive of end-organ dysfunction or renal insufficiency or pulmonary edema or hepatocellular dysfunction or thrombocytopenia.

Preeclampsia and eclampsia are associated with increased risk of maternal and neonatal morbidity and mortality. Pre-eclampsia and its attendant

complications to the mother and the baby is associated with the need for premature termination of pregnancy resulting in prematurity. Prematurity is associated with its own risks added to specific risks due to uteroplacental insufficiency of pregnancy induced hypertension (PIH). The risk to the baby includes stillbirth, respiratory morbidities (including respiratory distress syndrome, transient tachypnea of the newborn, persistent pulmonary hypertension, respiratory failure and bronchopulmonary dysplasia (3,1,4) and intrauterine growth restriction. Haematological complications in the newborn include thrombocytopenia and neutropenia, due to hypoxia or uteroplacental insufficiency induced suppression of megakaryocyte and myeloid cell lineage proliferation respectively (5) (6). Though, with regard to neurodevelopmental outcomes, pre-eclampsia is protective against the development of cerebral palsy (7). Also recent evidence suggests that preeclampsia is associated with improved scores on developmental testing at 18 months corrected age (8). A large population based study has shown that children exposed to preeclampsia are at higher risk of developing hypertension, obesity, diabetes and cardiovascular disease in adulthood, irrespective of differences in lifestyle such as smoking, exercise, socio economic status and diet (9).

Materials And Methods

Design Of The Study:

The study was conducted as a descriptive study in the department of Obstetrics and Gynaecology and department of Paediatrics in JIPMER from October 2013 to August 2015. Neonatal outcomes of babies born to 53 preeclamptic mothers are compared with outcomes of 53 babies born to normotensive women

Inclusion Criteria:

Study Group: Pregnant women diagnosed with preeclampsia based on blood pressure ≥ 140/90 mm of Hg on two occasions 4 hours apart and proteinuria > 0.3 g occurring after 20 weeks of gestation.

Control Group: Normotensive pregnant women matched for the age were included in the control group.

Exclusion Criteria:

Pregnant women with essential hypertension, gestational hypertension, gestational diabetes mellitus and eclampsia were excluded from the study.

Results

Neonatal Outcome:

A) Gestational Age:

The gestational age ranged from 24 to 41 weeks in preeclampsia and 38 to 42 weeks in controls. In preeclampsia group there were significant numbers of preterm births (p <0.001).

Table 1. Gestational age (in weeks) in the preeclampsia and control groups

Groups	Meangestationalage SD(weeks)	P value
Preeclampsia	36.39 ± 3.45	<0.001
Control	39.27 ± 1.08	

Table 2. Gestational age at birth occurring in preeclamptic and a control group of normotensive women

Groups	PRETERM(<37 WEEKS)	TERM (37 TO 42 WEEKS)	P value
PREECLAMPSIA(n=53)	23 (43.4%)	30 (56.6%)	< 0.001
CONTROL(n=53)	0 (0%)	53 (100%)	

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B) Birth Weight:

Twenty five neonates (47.2%) born to preeclamptic women are of low birth weight (< 2.5 Kg), whereas 7 neonates (13.2%) born to control group are of low birth weight. Very low birth weight (< 1.5 kg) occurred in 15 preeclamptic women(28.3%) and one baby (1.9%) was extremely low birth weight (< 1 kg). Among the control group of normotensive women, there were no very low birth weight or extremely low birth weight babies.

Table 3. Birth weight (in grams) in the preeclampsia and control groups

Groups	Mean ± SD Birthweight(ingrams)	P value
Preeclampsia	2000 ± 670	< 0.001
Control	2770± 380	

Table 4. Fetal outcome in relation to birth weight in preeclampsia and control groups

Groups	ELBW	VLBW	LBW	NORMAL	P value
Preeclampsia(n=53)	1 (1.9%)	15 (28.3%)	25 (47.2%)	12 (22.6%)	< 0.001
Control(n=53)	0	0	7 (13.2%)	46 (86.8%)	

The statistical analysis for comparison of neonatal outcome in relation birth weight between preeclampsia and control groups was significant ($p < 0.01$)

C) Live Birth Versus Fetal Death Or Stillbirth

In the group of preeclamptic women, there was a total of five (9.4%) fetal deaths or stillbirth. There were no fetal deaths or stillbirth in the control group.

Table 5. Comparison of fetal deaths or stillbirths in preeclamptic women compared with normotensive women

Groups	DEAD	LIVE	P value
PREECLAMPSIA(n=53)	5 (9.4%)	48 (90.6%)	0.02
CONTROL(n=53)	0 (0%)	53 (100%)	

There was significant increase in the number of fetal deaths or stillbirth in preeclamptic women compared to normotensive women (p=0.02).

D) Histomorphological Features

In this study it is found that the histomorphological features like subchorionic fibrin, infarction, focal calcification, increased villous vascularity, increased syncytial knots, endarteritis obliterans, cytotrophoblastic proliferation, villous stromal fibrosis and fibrinoid necrosis are more common in preeclamptic women than normal women (Table 6).

Table 6. Comparission of histopathological features between preeclampsia and normal women

	Present (%)	Absent (%)	P - value
Subchorionic fibrin			
Preeclampsia	8(15.1)	45 (84.9)	0.22

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Normal	4 (7.5%	49 (92.5)	
Infarction			
Preeclampsia	20 (37.7)	33 (62.3)	< 0.0001
Normal	0	53 (100)	
Focal calcification			
Preeclampsia	32 (60.4)	21 (39.6)	< 0.0001
Normal	10 (18.9)	43 (81.1)	
Increased villous vascularity			
Preeclampsia	33 (62.3)	20 (37.8)	<0.0001
Normal	10 (18.9)	43 (81.1)	
Increased syncytial knots			
Preeclampsia	50 (94.3)	3 (5.7)	<0.0001
Normal	28 (52.8)	25 (47.2)	
Endarteritis obliterans			
Preeclampsia	25 (47.2)	28 (52.8)	<0.01
Normal	15 (28.3)	38 (71.7)	
Cytotrophoblastic prolifearion			
Preeclampsia	33 (62.3)	20 (37.7)	<0.0001
Normal	11 (20.8)	42 (79.2)	
Villous stromal fibrosis			
Preeclampsia	24 (45.3%)	29 (54.7%)	<0.0001
Normal	6 (11.3%)	47 (88.7)	
Fibrinoid necrosis			

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Preeclampsia	27 (50.9%)	26 (49.1)	<0.0001
Normal	5 (9.4%)	48 (90.6)	

E) Fetal Outcome :

In this study the histomorphological features of the placenta are correlated with the birth weight. It was found that there is a significant positive correlation between placental weight and birth weight (p=0.0047). Also there is a significant negative correlation between histomorphological features like subchorionic fibrin, infarction, calcification, increased villous vascularity, syncytial knots, cytotrophoblastic proliferation, villous stromal fibrosis, and fibrinoid necrosis with birth weight.

Table 7 - Correlation Of Fetal Outcome (Birth Weight) With Placental Changes:

Placental Changes	**BIRTH WEIGHT**	
	Correlation coefficient (r)	**p Value**
Placental weight	0.2729	0.0047*
Subchorionic fibrin	-0.1723	0.0773
Infarction	-0.5154	< 0.0001*
Calcification	-0.2094	0.0312*
Villous vascularity	-0.1862	0.0560
Syncytial knots	-0.2302	0.0176*
Endarteritis obliterans	0.01354	0.8904
Cytotrophoblastic proliferation	-0.3030	0.0016*
Villous stromal fibrosis	-0.4027	<0.0001*
Fibrinoid necrosis	-0.3078	0.0013*

***Significant p value (< 0.05)**

Discussion

Studies have shown that neonatal and post- neonatal mortality of infants born and delivered preterm due to maternal pre-eclampsia increases with decreasing gestational week at delivery (10). Increase in perinatal morbidity and mortality is primarily due to the need for preterm delivery and placental insufficiency resulting in fetal compromise (11,12).

Continuation of pregnancy till term may pose both the mother and baby at risk for complications. This includes maternal complications like eclampsia, abruptio placenta and HELLP syndrome and fetal complications like fetal growth restriction and death. The optimal time of delivery of the fetus is 37 weeks, the time at which the maternal and fetal risks of continuing pregnancy outweigh the benefits of delivering at term gestation (13). A multidisciplinary, collaborative approach is necessary to weigh the maternal and fetal risks of prolonging pregnancy versus the potential benefits of further prolonging the pregnancy (14).

Delivery at 37 weeks is reasonable for all women with severe preeclampsia at or less than 34 weeks. Contrary to popular belief, delivery at 34 - 36 weeks is at significant risk of complications especially respiratory complications (15,16) compared with term infants. Also the need for supplemental oxygen and assisted ventilation increases with decreasing gestational week at delivery.

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The risk of fetal demise and stillbirth is less in mild preeclampsia compared to severe pre-eclampsia. The small but important risk of fetal death must be balanced against the potential benefits of continuing pregnancy. For the same birth weight, SGIA infants are at significant risk of mortality than AGA infants. The risk of growth restriction is more with severe pre-eclampsia than mild pre-eclampsia.

Birth Weight

Abadi et al (17) found that babies born to PIH mothers have higher risk of LBW than normotensive women found that adverse neonatal ant eclamptic women (OR 5.1). Women with preeclampsia were twice as likely as women with Eclampsia to have adverse outcomes (1.91-OR, P0.04). Ramya et al (18) found that women with preeclampsia, gestational hypertension or eclampsia had higher incidence of low birth weight than control group ($p < 0.01$). In another study 28.9% of women with PE had LBW (19).

Gestational Age

Abadi et al (17) found that women with PIH had higher risk of preterm delivery (aRR 5.2) and small for gestational age (aRR 3.3). In two other studies (18, 20), there is a higher risk of preterm deliveries with preeclampsia compared with controls ($p < 0.05$). Mohd Suleiman et al (19) found that 28% of preeclamptic women delivered preterm.

Still Birth/ Perinatal Death

The risk of perinatal death is higher in (ARR 3.46) preeclampsia (17). In a study by Kerri (21), there were 18 (28%) neonatal deaths in preeclamptic women compared with no deaths in control mothers.

Admission To NICU

The risk of NICU admission is higher in babies born to PIH mother than normotensive women (aRR 5.1) (17). Babies born to PIH mothers compared with had high rates of NICU admission compared with normotensive women (P=0.007) (18).

Other Neonatal Morbidities.

The risk of birth asphyxia is higher in babies of PIH mother compared with normotensive women (aRR 2.6) (17). In a study by Dipak madavi (22), it was found that among babies born to PIH found that mother, 31.03 had IUGR, 45.9% had respiratory distress syndrome, 12.6% had asphyxia, 10.34% had necrotising enterocolitis and neutropenia is seen in 45.9% of cases.

The study shows that there is a significant increase in the poor outcomes of neonates born to preeclamptic women than a control group of normal pregnancies. However, the risk of adverse outcomes could not be compared with the outcomes of normal pregnancies. Comparing with preterm deliveries due to other causes like chorioamnionitis, preterm labour, etc would me more optimal. Even then adjusting for confounding factors like gestational age, antenatal steroids, mode of delivery, gender, birth weight, multiple births and IUGR between the preterm deliveries indicated by preeclampsia and other causes would give a clear estimate of the effect of preeclampsia on these outcomes (23).

Histomorphological Features

In a study done by Ghore et al, it was found that there is a significant increase in adverse pathological lesions in women with preeclampsia compared to normal women. Also there is a significant decrease in the birth weight of babies born to preeclamptic women (24). Deepak et al used a comprehensive scoring system and found increased scores correlating with significant placental pathological lesions like fibrin deposition, infarction, calcification, villous fibrosis and increased syncytial knots in women with preeclampsia (25).

Conclusion

Evidence from the study suggests that there is a significant increase in poor neonatal outcomes of low birth weight, prematurity and neonatal death or stillbirth rates. Further research is needed with preterm deliveries due to other causes as controls after adjusting for confounding factors to estimate the effect on neonatal outcomes due to preeclampsia. In addition, there are significant placental pathological lesions in women with preeclampsia. There is also a significant positive correlation between placental weight and birth weight.

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