

# Outcomes of Perinatal Pathology in Newborn from Mothers with Early Pre-Eclampsia

Abduraim Shamshievich Arzikulov<sup>1</sup>, Yulduz Gulyamovna Rasul-Zade<sup>2</sup>,  
Dilnoza Abduraimovna Melieva<sup>1</sup>, Abdikadir Gulyamovich Arzibekov<sup>1</sup>

<sup>1</sup>Andijan State Medical Institute, Andijan, Uzbekistan

<sup>2</sup>Tashkent Pediatric Medical Institute, Tashkent, Uzbekistan

**Abstract** Preeclampsia (PE) is a leading cause of maternal and perinatal morbidity and mortality. PE can be divided into early-onset PE, which requires delivery before 34 weeks' pregnancy, and late-onset PE, which occurs during or after 34 weeks, the former being associated with a higher incidence of adverse outcomes. Purpose of the research: to study the health status of newborns born to mothers with early preeclampsia. Materials and methods: the work was performed at the clinical base of the maternity complex No. 1 in Andijan, Republic of Uzbekistan. We performed an analysis of the birth history of pregnant women with preeclampsia and their newborns (n=112 couples) for the period 2018-2022, including those with early (n=41) and late onset of PE (n=71), data assessing the condition of newborns on the Apgar scale immediately after birth, assessment of the degree of maturity of newborns (prematurity, hypoxic damage to the central nervous system), the incidence of stillbirth. The work used anamnestic, general clinical, obstetric-gynecological, instrumental-functional and laboratory research methods. Results and discussion: Hypoxic damage to the central nervous system (82.9%), malnutrition (19.5%) and extreme prematurity (4.8%), perinatal mortality (4.8%) are significantly more often diagnosed. With the early PE development, during pregnancy up to 33 weeks + 6 days, the structure of perinatal pathology becomes more severe and aggressive. Conclusion: One of the reserves for reducing perinatal complications is identifying pregnant women at high risk of developing PE and performing targeted, effective preventive measures, especially during its early development.

**Keywords** Early preeclampsia, Perinatal pathology, Hypoxic damage to the central nervous system

## 1. Introduction

Preeclampsia (PE) as a complication of pregnancy, with its consequences threatens not only the pregnant woman, but also the normal course of fetal development. This fact is indicated by numerous research works by scientists in our country and abroad [1,2,3,4,5,6,7,8,9]. The early development of preeclampsia in pregnant women is especially dangerous for the development of the fetus [9]. In the specialized literature there are isolated reports on the consequences of early development of preeclampsia on the health status of the newborn [8,9]. Disorders of the uteroplacental circulation, which, being a pathophysiological manifestation of preeclampsia, lead to the development of hypoxic damage to the central nervous system and, ultimately, to a holistic metabolic disorder of the developing fetus [6]. In newborns from mothers with early preeclampsia, there is a high proportion of perinatal complications of hypoxic damage to the central nervous system, the birth of an immature child with different degrees of prematurity, and cases of stillbirth [7,8,9]. One of the reserves for reducing perinatal complications is identifying pregnant

women at high risk of developing preeclampsia and performing targeted, effective preventive measures, especially during its early development. The relevance of the work performed lies in the fact that the frequency of development of severe PE and eclampsia in the city. Andijan has a clear upward trend in this indicator. The incidence of pregnant women with PE and eclampsia during pregnancy in the city. Andijan for the analyzed period is significantly higher than in the whole Republic (7.3% versus 4.0%, ( $p < 0.05$ )). In general, in the region there is no clear trend towards a decrease in the frequency of PE, especially its severe forms; on the contrary, a moderate increase can be observed [2,4].

Thus, the above convincingly indicate the relevance of studying the health status of newborns born to mothers with the early development of preeclampsia in the region.

## 2. Materials and Methods

The work was performed at the clinical base of the maternity complex No. 1 in Andijan. All examined patients and their newborns were divided into the following groups: 1) patients with normal pregnancy without clinical and laboratory signs of PE and their newborn infants (n=297); 2) a group of patients with early-onset PE (EOPE) (up to 34

weeks) and their infants (n=41); and 3) newborns born to mothers with late-onset PE (LOPE) (after 34 weeks) (n=71).

Women with normal pregnancies were defined as those without a medical, obstetric, or surgical complication during pregnancy, appropriate for gestational age, at term ( $\geq 37$  weeks' gestation) (1, 5) and without a neonatal complication.

Preeclampsia was defined as the onset of hypertension (systolic blood pressure  $\geq 140$  mmHg and/or diastolic blood pressure  $\geq 90$  mmHg on at least two occasions, 4 hours to 1 week apart) after 20 weeks of pregnancy with proteinuria ( $\geq 300$  mg per day) in urine collection or at least one dipstick measurement  $\geq 2+$  (1).

Newborns born to women with multiple pregnancies, fetuses with chromosomal and/or congenital abnormalities, and newborns born to women with HELLP syndrome or who developed preeclampsia after delivery were excluded.

Collecting blood and its use for research purposes were approved by the ethical commission at the Andijan State Medical Institute.

An analysis of perinatal outcomes and the structure of perinatal pathology in newborns from mothers in two studied groups of pregnant women was performed in a comparative aspect: a group of newborns born from mothers without PE (screening negative pregnant women with PE n=247%) and in a group of newborns born from pregnant women at risk for PE (screening positive pregnant women with PE n = 162%), including those with early (n=41) and late onset PE (n=71), assessment of the condition of newborns using the Apgar scale immediately after birth, assessment of the degree of prematurity and hypoxic damage to the central nervous system (CNS) using A.V. Volodin's criteria (2005), the incidence of stillbirths.

The severity of perinatal CNS lesions in newborns was assessed according to the accepted classification of the Russian Association of Perinatal Medicine Specialists (2000): for a mild degree (cerebral ischemia of grade I) severity, symptoms of depression/excitation were characteristic for no more than 5-7 days. The group of moderate severity (cerebral ischemia grade II) included newborns with characteristic syndromes of central nervous system depression and/or excitation (more than 7 days), the appearance of seizures, signs of intracranial hypertension and autonomic-visceral disorders. In newborns with severe hypoxia (cerebral ischemia grade III), clinical symptoms of severe depression syndrome were detected, infant agitation for more than 10 days, convulsive syndrome (possible convulsive epistatus), decerebration, dysfunction of the stem parts of the central nervous system, decortication, autonomic-visceral disorders, symptoms progressive intracranial hypertension.

Statistical analysis of the data was performed using generally accepted methods of variation statistics on a personal computer using the Microsoft applied statistics software package Excel 2010, Statistica 6.1., SigmaPlot, Medcalc (9.1.0.1). The arithmetic mean (M), the error of the mean (x), and the standard deviation (a) were calculated. Statistical processing methods were used depending on the type of random variables and the research problem. The level of

statistical significance when testing the null hypothesis was taken at the corresponding  $p < 0.05$ .

The work used anamnestic, general clinical, obstetric-gynecological, instrumental-functional and laboratory research methods.

### 3. Results and Its Discussion

The results of a study of the perinatal pathology structure in newborns from mothers of the compared subgroups (Table 1) indicate that low indicators of the maturity of the newborn's body according to the Apgar assessment method and the correlative connections with it of an increase in indicators of hypoxic damage to the central nervous system of moderate severity were diagnosed reliably often in infants of the examined cohort of pregnant patients with screening (+) PE (n = 162, 20.9%;  $P > 0.005$ ), low assessment of newborn maturity (n = 35, 21.09). In the same group, a high incidence of malnutrition was noted (n = 8, 4.9%), including those with a weight less than 1500 - extreme prematurity (n = 2, 1.2%) and perinatal mortality (n = 3, 1.9%).

**Table 1.** Structure of perinatal pathology in newborns from mothers of compared subgroups of pregnant women

Indicators	Pregnancy without PE n =247 (%)	Pregnancy with PE n =162 (%)	P
Assessment of newborn maturity using the Apgar scale P (%):			
7-10 points	225 (91.6)	127 (78.01)	nd
5-6 points	22 (8.4)	35 (21.09)	$P > 0.05$
Weight of newborns, gr.	3300+110.1	3065+93.0	$P > 0.05$
Neonatal hypotrophy	3 (1.2)	8 (4.9)	$P > 0.01$
Including:			
very prematurity	0	2 (1.2)	$P > 0.05$
Perinatal mortality	0	3 (1.9)	
Including:			
Neonatal	0	1 (0.6)	
antenatal	0	2 (1.3)	
Hypoxia of CNS:	10 (5)	43 (26.4)	nd
1) mild degree	7 (4.1)	8 (5.5)	
2) medium degree	3 (0.9)	35 (20.9)	

The same indicators were assessed depending on the time of onset PE in pregnant women.

The results are reflected in Table 2.

Significantly more often diagnosed were hypoxic damage to the central nervous system (82.9%;  $P > 0.05$ ), malnutrition (19.5%;  $P > 0.05$ ) and extreme prematurity (4.8%;  $P > 0.05$ ) and perinatal mortality (4.8%;  $P > 0.05$ ).

With the early PE development, during pregnancy up to 33 weeks + 6 days, the structure of perinatal pathology has become more severe and aggressive [10,11,12]. In pregnant women in the observed cohort with a positive screening for PE, the course of pregnancy was often complicated by the threat of miscarriage compared to pregnant women in the

study cohort with a negative screening result. The results of our studies confirm that newborns of patients with positive early preeclampsia significantly often had low maturity scores on the Apgar assessment scale ( $n = 35$ , 21.09;  $P > 0.001$ ), low weight of newborns ( $3065 \pm 93.0$ ;  $P > 0.001$ ) and trophic disorders, including in the form of extreme prematurity (1.2%). Neonatal (0.6%) and antenatal mortality (1.3%) were also common in this group. Indicators of moderate hypoxia of the central nervous system were significantly high in infants of the cohort of pregnant women with a screening positive result for PE ( $P > 0.005$ ). Significantly more often pregnancy occurred against the background of mild anemia in pregnant women in the study cohort with (+) screening results (61.53% and 19.35%, respectively,  $p = 0.009$ ) than in pregnant women in the cohort with (-) screening. Frequency indicators threatened preterm birth was the same in patients of both studied subgroups (38.46% and 12.90% in the subgroups with (+) and (-) results, respectively,  $p = 0.06$ ).

**Table 2.** Structure of perinatal pathology in newborns depending on the timing of the onset of PE

Indicators	Late-onset PE $n=71$ (%)	Early-onset PE $n=41$ (%)	P
Assessment of newborn maturity using the Apgar scale P (%):			
7-10 points	58 (81.2)	9 (24.4)	$P > 0.01$
5-6 points	13 (18.8)	32 (75.6)	$P > 0.005$
Weight of newborns, gr.	$2700 \pm 20.1$	$2350 \pm 53.0$	$P > 0.05$
Neonatal hypotrophy	3 (1.2)	8 (19.5)	$P > 0.05$
Including: extreme prematurity	0	2 (4.8)	$P > 0.05$
Perinatal mortality		3 (7.3)	
Including:	0	1 (2.4)	
Neonatal antenatal	0	2 (4.8)	
Hypoxia of the central nervous system:			
1) mild degree	7 (13)	47 (82.1)	$P > 0.001$
2) medium degree	6 (12.1)	11 (19.2)	$P > 0.01$
	1 (0.9)	36 (62.9)	$P > 0.05$

No significant differences in blood flow disturbances during Doppler measurements in both cohorts during pregnancy 11-14 weeks. Other researchers also pointed out the absence of Doppler differences in blood flow disturbances in early pregnancy [11] (23.07% and 26.45%). In the period of 18-21 weeks, disturbances of the uteroplacental blood flow significantly prevailed in pregnant women of the study cohort with a positive screening result for PE. In this group of pregnant women, the proportion of newborns with post-hypoxic damage to the central nervous system is significantly high (53.84% and 16.12%;  $p = 0.01$ ). In this group, disorders of the uteroplacental circulation before childbirth, compared with patients in the subgroup with (-) screening, hemodynamic disturbances of

degree I were often encountered, which can be considered as a pathophysiological cause of post-hypoxic damage to the central nervous system in newborns (53.84%, 12.90%,  $p = 0.007$ ).

Cesarean section was performed significantly more often (76.92% of cases, and in the subgroup with (-) results in 25.80% of cases ( $p = 0.002$ ). For urgent surgical delivery in half of the pregnant women in the subgroup with with (+) screening were increasing fetal distress syndrome. Anomalies of labor, a scar on the uterus or combined developmental complications in the interests of the fetus were indications for surgical treatment in the subgroup of pregnant women with (-) results on PE.

## 4. Conclusions

In newborns from mothers with early preeclampsia, there is a significantly high proportion of perinatal complications in the form of hypoxic damage to the central nervous system ( $P > 0.2$ ), the birth of an immature child with different degrees of prematurity and extremely low prematurity ( $P > 0.005$ ), cases of stillbirth ( $P > 0.001$ ). In the study group of newborns, birth weight was lower than in the control group ( $p < 0.001$ ). Most births in the group of newborns born to mothers with preeclampsia are performed by cesarean section.

One of the reserves for reducing perinatal complications is identifying pregnant women at high risk of developing preeclampsia and performing targeted, effective preventive measures, especially during its early development.

Until now, the main problem of modern obstetrics is the early detection of pregnancies with a high degree of risk of early-onset PE and the adoption of the necessary preventive measures to improve placentation and reduce the incidence of perinatal complications. Mastrolia Salvatore Andrea et al. [13] in their research conclude that, despite some success in reducing the incidence of early PE, overall, trends in improving maternal and perinatal outcomes in women with pregnancies complicated by PE remain insignificant. Another reserve for reducing perinatal complications in patients with early PE, in our opinion, is the organization of personalized PE prevention, identifying women of childbearing age with high-risk indicators. Pregestational care can be especially useful for women who have risks of developing PE (demographic, anamnestic, somatic, psycho-social) to avoid spontaneous pregnancy. Targeted support for these women before conception can make a useful contribution to reducing the incidence of early-onset and severe PE. New cohort studies with a representative sample are required to evaluate the effectiveness of targeted pregestational care to reduce the incidence of PE and perinatal complications.

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