

## Original Research

### Efficiency of the risk scale of extreme premature labor

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#### ABSTRACT:

According to the latest WHO reports, 15 million babies are born prematurely every year, which is more than one tenth of the total number of newborns in the world. The incidence of premature birth (PR) globally ranges from 5–18% [15]. The proportion of births with gestational age less than 28 weeks in the world is only 5.2%, but in economically developed countries, more than 45% of perinatal deaths are associated with them [15]. Despite a huge number of scientific studies devoted to methods of predicting, preventing and treating this complication of pregnancy, the number of PRs not only does not decrease, but has a stable tendency to increase [7, 14].

**Key words:** preterm birth, very early preterm birth, obstetric risk, risk scale, children with extremely low body weight

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#### INTRODUCTION

In Russia, depending on the region, the frequency of PR until 2012 ranged from 3.7% to 3.9% of the total number of births [2, 5, 8, 10, 11]. In the Russian Federation in 2012, the share of very early PRs accounted for 0.52% of all births [1]. Order of the Ministry of Health and Social Development of Russia No. 1687n of December 27, 2011 "On medical criteria for birth, the form of a birth document and the procedure for issuing it", which approved new criteria for birth and registration of newborns from 22 weeks of gestation, contributed to a change in this indicator. On average, the frequency of PR in Russia, according to 2014 data, increased to 4.4% [5]. In newborns with extremely low body weight, perinatal CNS damage, bronchopulmonary dysplasia, and severe retinopathy are noted [12]. In childhood and adolescence, such children often suffer from cerebral palsy, mental retardation, blindness, and deafness [6, 9].

Prevention of the development of PD remains an urgent task of modern obstetrics, which cannot be carried out without a proper understanding of the etiology and pathogenesis of this complication. Proven risk factors for PR include a history of prematurity and miscarriage, surgical treatment of non-inflammatory diseases of the cervix, and the presence of foci of chronic infection in the body of a pregnant woman [3, 4, 17, 24].

As a way to predict the risk of AR, there have been attempts to develop a unified risk scale. Thus, in a study by J. A. Bastek et al. with the participation of 583 pregnant women, the enlargement of the internal pharynx by ultrasound cervicometry, smoking, lack of follow-up during pregnancy, and a history of early and late reproductive losses were included in the PR risk scale up to 37 weeks of gestation [13]. The sensitivity of this scale was 79%, specificity - 50%, predictive value of a positive result (PCPR) - 46%, predictive value of a negative result (PCVR) - 82%. However, a Cochrane

meta-analysis that covered 15 published studies of ways to predict PR by risk scales found the ineffectiveness of using any methods of calculating risk factors in relation to reducing the frequency of PR [17]. Despite this, from our point of view, the creation of a risk scale taking into account all reliable predictors of AR will help to provide timely and adequate care to patients with threatening AR. Purpose of the study was to improve the outcomes of PR based on the use of the risk scale for very early PR in pregnant women with threatening PR.

## MATERIALS AND METHODS

Retrospectively analyzed 194 histories of pregnancy and childbirth of women admitted to the 1st clinic of SamMI in the maternity ward with regular contractions and shortening of the cervix less than 25 mm at a gestational age of 22 weeks - 27 weeks + 6 days.

The criteria for inclusion in the study were singleton pregnancy, gestational age 22 weeks - 27 weeks + 6 days, the presence of at least four contractions in 20 minutes of observation, and shortening of the cervix less than 25 mm according to transvaginal ultrasound cervicometry.

The criteria for exclusion from the study were grade 3 fetal malnutrition and congenital malformations of the fetus, severe extragenital diseases of the mother, severe preeclampsia, and eclampsia.

All pregnant women were divided into two groups: those admitted with signs of threatening PR and eventually gave birth before 28 weeks (105 women) and those who arrived with signs of threatening PR but gave birth more than 28 weeks (89 women).

The studied parameters included anamnestic data on past and concomitant extragenital and gynecological diseases, reproductive history, complications of the current pregnancy.

Statistical analysis was performed using the Statistica for Windows data program, version 6.0 (StatSoft Inc., USA). The critical value of the level of statistical significance when testing null hypotheses was taken equal to 0.05. When creating a scale for predicting ultra-early PRs, regression with Optimal Scaling was chosen as a regression model, which is implemented in the statistical program Statistical Package for the Social Sciences. To assess the diagnostic efficiency of the created scale, an ROC analysis was performed using the Statistical Package for the Social Science

## RESULTS

In the course of the analysis, a number of risk factors for very early PRs were identified (Table 1).

**Table 1 Comparative characteristics of predictors of very early preterm birth**

Predictors	1 <sup>st</sup> group childbirth up to 28 weeks		2 <sup>nd</sup> group childbirth after 28 weeks		P
	Abs	%	Abs	%	
<b>Age 35 and older</b>	39	37,1	9	10,1	0,0315
<b>Body mass index <math>\geq</math> 30</b>	41	39,0	11	12,4	0,0329
<b>Lack of marriage</b>	47	44,8	13	14,6	0,0213
<b>Low level of education</b>	45	42,9	7	7,9	0,0082
<b>Irregular monitoring of pregnancy</b>	61	58,1	0	0	0,001
<b>Pre-mediated arterial hypertension</b>	30	28,6	5	5,6	0,0416
<b>Uterus myoma</b>	14	13,3	0	0	0,0001
<b>Malnutrition</b>	48	45,7	0	0	0,0001
<b>Anemia during pregnancy</b>	20	19,0	4	4,5	0,0030

Here and in Table 2, a low educational level is understood as the absence of vocational secondary or higher education. Pregnant women from the first group who gave birth before 28 weeks of gestation were at an older reproductive age (women 35 years and older - 37.1% versus 10.1% in the second group), had a lower socioeconomic status (42.9% against 7.9% in the second group) and more often suffered from extragenital (pregestational arterial hypertension occurred in 28.6% of patients in the first group and in 5.6% in the second group) and gynecological diseases (uterine myoma was detected in 13.3% of patients in the first group and was not found in any patient of the second group) compared with pregnant women who gave birth at a time exceeding 28 weeks.

Next, we carried out a regression analysis with optimal scaling to assess the significance of predictors of very early PR. The resulting importance coefficients were chosen as weights to create a scale. For each of the nine predictors included in the regression model, scores were calculated by multiplying the absolute value of the importance coefficient by 100 and rounding to whole numbers (Table 2).

**Table 2. Results of regression analysis for assessing the significance of risk factors for early preterm birth**

Risk factors	Standardized ratios		P	Partial correlation coefficient	Importance factor	Scores
	$\beta$	Standard error				
Age 35 and older	0.169	0.094	0.045	0.196	0.063	6
Body mass index $\geq 30$	0.069	0.070	0.383	0.080	0.018	2
Lack of marriage	0.044	0.093	0.803	0.046	0.032	3
Low level of education	0.306	0.083	0.001	0.302	0.230	23
Irregular monitoring of pregnancy	0.229	0.078	0.001	0.240	0.172	17
Pre-mediated arterial hypertension	0.079	0.103	0.561	0.090	0.036	4
Uterus myoma	0.058	0.092	0.671	0.060	0.020	2
Malnutrition	0.406	0.077	0.001	0.439	0.363	36
Anemia during pregnancy	0.144	0.070	0.018	0.182	0.067	7

To determine the threshold value of the total score associated with a high risk of very early PR, an ROC curve was constructed (Table 3).

**Table 3. Area under the ROC curve**

Region	Standard error	Asymptomatic 95% DI	
		bottom line	upper line
0.958	0.018	0.924	0.992

The optimal cut-off threshold for the sum of points, which made it possible to divide pregnant women into two risk groups, corresponded to a value of 7 points. When conducting a cross-check of the adequacy of the model on our sample, the actual frequency of very early ARs in the high-risk group was calculated according to the total scale (Table 4).

**Table 4 Cross-check of the adequacy of the model on the sample**

Total score	Number of cases of prognosis of premature birth		Sensitivity, %	Specificity, %	PCPR*	PCOR**
	Abs	%				
7 and more (n=127)	122	96.1	92.4	89.4	94.6	85.5
Less than 7 (n=67)	10	14.9				
P	0.001					

\* PCPR is the predictive value of a positive result.

\*\* PCOR - negative predictive value.

This predictive model has demonstrated high diagnostic value. The sum of risk factors scores of 7 or more had a sensitivity of 92.4%, a specificity of 89.4%, a PCPR of 94.6%, and a PCV of 85.5%.

In the available literature, we did not find studies on the creation of a risk scale for ultra-early PR. However, many of the risk factors identified in our study are described by foreign authors. Thus, according to the results of a number of studies, women from the older age group have an increased risk of PR and an unfavorable outcome of childbirth [21,

22]. Possible risk factors for PD have also been attributed by researchers to disorders of fat metabolism [18–20], low socioeconomic status, and unsettled family life [16, 23].

## CONCLUSION

The proposed risk scale for very early preterm birth (PR) in pregnant women with threatening PR (see Table 2) demonstrated a high diagnostic value: sensitivity was 92.4%, specificity - 89.4%, predictive value of a positive result - 94.6%. the predictive value of a negative result is 85.5%. The sum of scores 7 and above allows attributing a pregnant woman with clinical manifestations of threatening PR to a high-risk group, starting tocolytic therapy in a timely manner, preventing respiratory distress syndrome of the fetus and ensuring the transportation of the pregnant woman to a level III hospital.

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