

Posokhova S. P., Kucherenko O. U. Comprehensive assessment of the premature fetus condition in pregnant women with prelabor rupture of membranes. *Journal of Education, Health and Sport*. 2020;10(12):256-262. eISSN 2391-8306. DOI <http://dx.doi.org/10.12775/JEHS.2020.10.12.025> <https://apcz.umk.pl/czasopisma/index.php/JEHS/article/view/JEHS.2020.10.12.025> <https://zenodo.org/record/4479322>

The journal has had 5 points in Ministry of Science and Higher Education parametric evaluation. § 8.2) and § 12.1.2) 22.02.2019.
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The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 09.11.2020. Revised: 25.11.2020. Accepted: 28.12.2020.

COMPREHENSIVE ASSESSMENT OF THE PREMATURE FETUS CONDITION IN PREGNANT WOMEN WITH PRELABOR RUPTURE OF MEMBRANES

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Abstract

Introduction. Perinatal hypoxia - ischemia is the cause of 30 - 35% of neonatal fatalities. Inflammatory factors such as prolonged rupture of membranes, maternal fever, are often accompanied by chorioamnionitis, associated with the birth of low Apgar scores children, convulsions of newborns and the diagnosis of "birth asphyxia" in infants who then develop cerebral palsy. **The objective:** to assess the condition and behavior of the premature fetus in pregnant women with prelabor rupture of membranes **Materials and methods.** The treatment (main) group (TG) consisted of 80 pregnant women with singleton pregnancies who gave birth to premature infants at gestation 27 + 6 - 34 weeks. The comparison group (CG) included 60 pregnant women at 27 + 6 - 34 weeks of gestation who were hospitalized with spontaneous preterm birth. Ultrasound examination to determine the behavior of the fetus on the scale of the neurological test KANET was performed. **Results and discussion.** The most common complication was the threat of abortion in the third trimester in CG pregnant women (76.6%), which is 1.3 times more if compared with TG (60%) data. Placental dysfunction and fetal growth retardation were 2 times greater in CG (TG-16.2%, CG-35%). One in five pregnant women in both groups had dehydration, which complicated the fetus's development and condition. The long anhydrous period of more than 48 hours was in 22 (36.6%) CG

pregnant women, which is 10 times more often than in the treatment group. In 7 (11.6%) cases, CG women had chorioamnionitis. KANET neurological test showed that the fetuses of the TG pregnant women with prelabor rupture of membranes, who underwent neuroprotection with magnesium sulfate in 87.5% of cases showed normal behavior. The fetuses of pregnant women from the CG had normal neurological behavior in only 64.5% of cases, i.e. 1.3 times less than in the TG. **Conclusions:** Prelabor rupture of membranes in premature pregnancy affects the course of pregnancy, leads to premature birth, increases the risk of intrauterine infection, changes the antenatal behavior of the fetus and can lead to hypoxic - ischemic brain damage with subsequent adverse effects.

Key words: hypoxic-ischemic encephalopathy; premature infants; KANET neurological test.

To preserve the lives and health of mothers and children is an urgent, strategically important priority of the state in the field of health care and one of the main Millennium Development Goals set by the UN [1]. Every year, 15 million premature babies are born in the world, 2.5 million infant deaths occur, which contributes to ~ 47% of infant mortality before the age of 5 [2]. Perinatal hypoxia-ischemia is the cause of 30 -35 % of neonatal fatalities [3]. Inflammatory factors, such as prolonged rupture of membranes, can have a pathogenic effect before delivery. The importance of inflammation as a risk factor for neonatal encephalopathy is illustrated by many studies. Recent studies have reported that independent risk factors for neonatal encephalopathy were intranatal maternal fever (BP 3.1, 95%; CI 2.3-4.2) and chorionamnionitis (BP 5.4, 95%; CI 3.6-7.8) [4]. In a prospective study of infants whose mothers had chorioamnionitis, there was a threefold increase in neonatal depression, fever and treatment in the neonatal intensive care unit [5]. Other studies have found that maternal fever, often diagnosed with chorioamnionitis, is associated with low Apgar scores, neonatal seizures, and a diagnosis of "birth asphyxia" in infants who develop cerebral palsy [6]. Risk factors for fetal distress include maternal fever (> 38.0° C), prelabor rupture of membranes, and chorioamnionitis on histological examination [7]. The development of an algorithm for early diagnostic criteria of the fetus's hypoxic brain injury during pregnancy and childbirth, comprehensive prevention and treatment measures, which allows to predict and treat this pathology adverse effects is an urgent problem [8].

The objective: to evaluate the condition and behavior of the premature fetus in pregnant women with prelabor rupture of membranes.

Materials and methods. The treatment group (TG) consisted of 80 singleton pregnant women who gave birth to premature infants at gestational age of 27 + 6 -34 weeks. TG pregnant women fetus' were constantly monitored and diagnosed, neuroprotection with magnesium sulfate was prescribed to the women under observation up to 32 weeks of gestation, and fetal respiratory distress syndrome prevention with dexamethasone 24 mg during gestation up to 34 weeks was performed.

In TG in the case of early prognostic signs of fetus's intrauterine infection labor or surgical delivery according to the indications was performed. To diagnose fetus's hypoxic brain damage and develop prevention methods, a comparison group (CG) was recruited. It included 60 pregnant women with spontaneous premature birth at gestation 27 + 6 - 34 weeks.

A fetus's complex assessment included antenatal cardiotocography (ACG), tone ultrasound examination, fetus's respiratory and motor activity, amniotic fluid volume, Doppler examination of uteroplacental and fetal-placental blood flow, determining the degree of placental maturity. All TG pregnant women after 28 weeks of pregnancy and CG 20 pregnant women had ultrasound examination to determine the neurological test KANET to predict antenatal hypoxic brain damage.

Results and discussion. Both groups pregnant women had numerous indications for hospitalization. The threat of abortion in the third trimester in CG pregnant women (76.6%) was the most frequent. It was met 1.3 times more often than in TG (60%). Placental dysfunction and fetal growth retardation were 2 times greater in CG (TG - 16.2%, CG - 35%). Every fifth pregnant women in both groups had dehydration, which complicates the fetus's development and condition. The above complications have an adverse effect on the development of the central nervous system of the fetus due to impaired uteroplacental blood flow and intrauterine hypoxia. Severe preeclampsia was almost 3.3 times more common in CG women, which also leads to fetal damage. One of the most serious complications that leads to acute hypoxia of the fetus and damage to its CNS is premature detachment of the placenta with bleeding. This complication was significantly more common ($p < 0.05$) in pregnant women from the comparison group (6.6%). It led to acute fetal hypoxia. The long anhydrous period of more than 48 hours was in 22 (36.6%) CG pregnant women and this is 10 times more often than in the TG. In 7 (11.6%) cases TG women had chorioamnionitis. In general, pregnancy complications were in 104 cases in the TG (130%) and in 126 (210%) cases in CG.

Thus, the pregnant women under examination, who gave birth prematurely had a combination of several complications during pregnancy, prelabor rupture of membranes, which led to impaired uteroplacental blood flow and fetus's hypoxia with brain damage.

Table 1

Obstetric complications in examined pregnant women

Indications / complications of pregnancy	Treatment group, n=80 Abs. (%)	Comparison group, n=60
Threat of premature labor	48 (60%)	46 (76,6%)
PLRM 24-48 hs	18 (22,5%)	13 (21,6%)
PLRM 48-168 hs	4 (5%)	14 (23,3%)*
PLRM more 168 hs	1 (1,25%)	8 (13,3%)*
Chorioamnionitis	1 (1,25%)	7 (11,6%)*
Expressed polyhydramnios	1 (1,25%)	4 (6,6%)*
Preeclampsia, severe	2 (2,5%)	5 (8,3%)*
Preeclampsia, moderate	12 (15%)	14 (23,3%)
Fetal growth retardation	13 (16,25%)	21 (35%)*
Placenta Premature Detachment	2 (2,5%)	4 (6,6%)*

Note: * Significance relative to TG p <0,05

It is known that an infectious agent is an important factor of the prelabor rupture of membranes and premature birth. In the research performed, we studied the state of the microbiocenosis of the birth canal of both groups pregnant women (Fig.1).

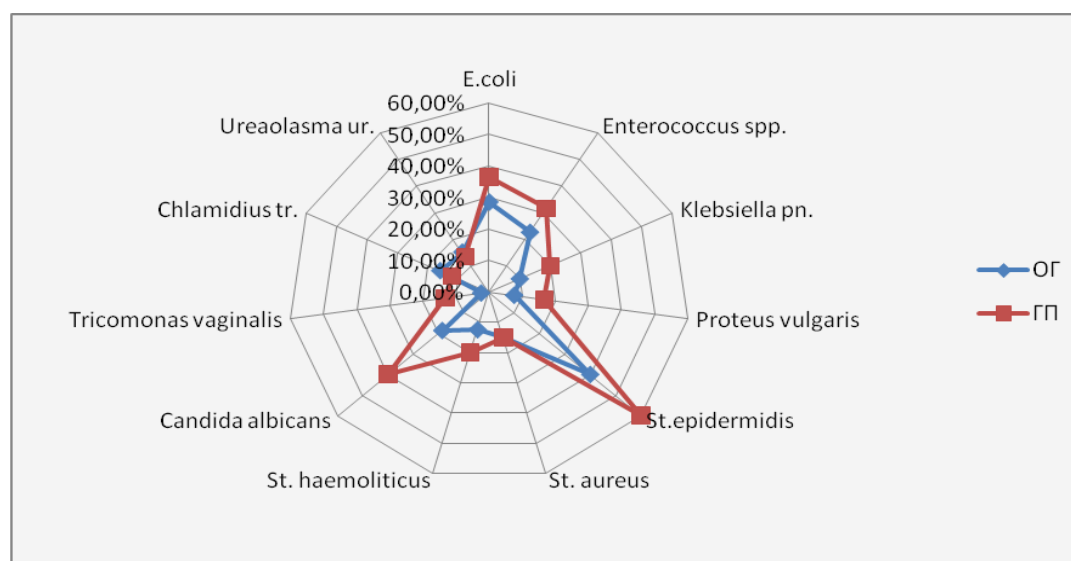


Fig.1. The composition of the microflora in pregnant women with PLRM

Among both groups pregnant women's vagina and cervical canal isolated microflora opportunistic gram-negative subjects dominated in 118 (84.2%) of cases, namely: *E. Coli* -55 (39.2%), *Enterococcus spp.* - 37 (26.4%).

In CG pregnant women *Klebsiella pneumoniae* -12 (20.0%) and *Proteus vulgaris* - 10 (16.6%) were 2 times more often. Gram-positive flora occurred in 112 cases (80.0%), namely: *St. epidermidis* - 68 (48.5%), *St. aureus* - 21 (15.0%), *St. haemolyticus* - 22 (15.7%). *Candida albicans* occurred 2 times more often in CG pregnant women, in 54 cases (40.0%). The high frequency of opportunistic pathogenic microflora indicates the combination of several species of microorganisms in the microbiocenosis of the pregnant women birth canal, which contributed to PLRM.

Ultrasound examination with the definition of the neurological test "KANET" included the following parameters of fetal behavior [9, 10]: isolated anteflexion of the head; overlap of cranial sutures and head circumference; isolated blinking of the eyes; change of face (grimace or tongue extension); neurological signs of the thumb, adduction of the thumb in a clenched fist; opening of the mouth (yawning or rubbing), isolated movements of the hands and feet, movements to the face, finger movements and the position of the thumb; Gestalt perception of the body and movements of the extremities with their qualitative assessment (fluidity, variability and amplitude).

Identification of "CNS depression" during fetal life is based on the quality of movements [10]. Interpretation of the total number of points: 0-5 points - incorrect neurological development and behavior of the fetus, a high risk of cerebral palsy in the future; 6-13 points - borderline neurological development and behavior of the fetus, the risk of minimal brain dysfunction, motor awkwardness; 14-20 points - normal neurological development and behavior of the fetus. Neurological test KANET, conducted to TG pregnant women did not confirm neurological disorders of fetal behavior. Neuroprotection was performed only for TG pregnant women. Fetal behavior differed in pregnant women after premature ejaculation of amniotic fluid (Table 2; Fig.2).

Thus, the fetuses of TG pregnant women with PLRM, who underwent neuroprotection with magnesium sulfate in 87.5% of cases showed normal behavior. The fetuses of CG pregnant women had normal neurological behavior in only 64.5% (1.3 times less than in TG). That is, 35.5% of fetuses had behavioral abnormalities, the number and frequency of movements were lower. Factors such as PLRM and dehydration affect the condition and behavior of the fetus, and may increase the risk of neurological disorders after birth.

Neurological test of KANET in pregnant women after premature rupture of amniotic membranes

Fetal behavior (observation for 30 minutes) Pregnancy 28-34 weeks	Treatment group with PLRM (24 - 168 hours) with neuroprotection, n=20	Comparison group with PLRM (24 & >168 hours), n=20
	Points, number (Abs.,%)	
Isolated anteflexion of the head	2 (20-100%)	2 (15-75%)
Overlap of cranial sutures and head circumference	2 (20-100%)	2 (18-90%)
Isolated blink of eyes	2 (15-75%)	2 (10-50%)
Adduction of the thumb in a clenched fist	2(12-60%)	2 (12-60%)
Facial change (grimace or tongue protrusion)	2 (20-100%)	2 (12-60%)
Mouth opening (yawning)	2 (18-90%)	2 (14-70%)
Isolated movements of arms and legs	2(18-90%)	2 (10-50%)
Finger movements and thumb position	2 (16-80%)	2 (14-70%)
Facial movements	2 (18-90%)	2 (12-60%)
Gestalt of body perception and limb movements	2 (18-90%)	2 (12-60%)
sum of points	20 (175-87,5%)	20 (129-64,5%)



Fig. 2. Photo of fetuses. " KANET neurological test

Thus, qualified observation, assessment of the fetus's condition and the choice of timing and delivery method will contribute to the birth of children without hypoxic-ischemic brain damage, disorders of physical and mental development.

Conclusions: Prelabor rupture of membranes in premature pregnancy affects its course, leads to premature birth, increases the risk of fetal infection, changes the antenatal behavior of the fetus and can lead to hypoxic-ischemic brain damage with subsequent adverse effects.

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