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## RISK FACTORS OF PERINATAL MORTALITY RELATED TO PREMATURE RUPTURED MEMBRANES IN CASE OF POLYHYDRAMNIOS

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### ФАКТОРЫ РИСКА ПЕРИНАТАЛЬНОЙ СМЕРТНОСТИ, СВЯЗАННЫЕ С ПРЕЖДЕВРЕМЕННЫМ РАЗРЫВОМ ПЛОДНЫХ ОБОЛОЧЕК ПРИ МНОГОВОДИИ

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Цель работы: выявление и исследование факторов риска летальности новорожденных от матерей, беременность которых осложнилась преждевременным разрывом плодных оболочек (ПРПО) при многоводии.

Проведено ретроспективное исследование 65 беременных и новорожденных при ПРПО с многоводием.

Установлено, что перинатальная смертность у беременных с ПРПО и многоводием зависит от гестационного возраста и массы плода при рождении. Выявлены факторы риска летальности новорожденных и приведены данные, которые необходимо учитывать во время ведения беременности и родов у женщин с ПРПО и многоводием (возраст матери; состояния, которые требуют назначения антибиотиков; положение плода в матке).

**Ключевые слова:** факторы риска, перинатальная смертность, преждевременный разрыв плодных оболочек, многоводие.

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Preterm premature rupture of membranes (PPROM) is their spontaneous rupture before the beginning of labor activity in the stages of pregnancy of 22–42 weeks. Premature rupture of membranes not only complicates the course of pregnancy and delivery, but is also a key risk factor for development of complications of infectious-inflammatory genesis of newborn babies and women in childbirth. Polyhydramnios is one of the risk factors of PPRM. According to the analysis data, PPRM population frequency in case of polyhydramnios makes 5.24%. Understanding of this problem leads to the necessity of applying of interventions aimed at PPRM prevention both at the stage of pre-conception care and during pregnancy and breast-feeding.

**Key words:** risk factors, perinatal mortality, premature ruptured membranes, polyhydramnios.

### Introduction

Premature rupture of membranes (PPROM) is a serious problem that obstetricians have to change, as such pathology significantly complicates labor activities, and results in complications that can be found both in women in childbirth and in newborns.

It is a well-known fact that those newborns who were born with extremal body mass and early gestational age, will face in

the future adverse long-term consequences related to defects of the nervous system, auditory and visual analyzers, respiratory system, psychiatric disorders and learning disabilities. The above mentioned diseases result in significant increase of child morbidity and disability.

### Review of publications related to polyhydramnios

Polyhydramnios — a form of obstetric pathology characterized by increase in the amount

of amniotic fluid over 1,500 ml [1]. There is no single reason for polyhydramnios, it can be the result of foetal malformation, mother's illness (diabetes, syphilis, infectious diseases), immune intolerance of the organisms of mother and foetus, polyhydramnial pregnancy, abnormal secretion of chorionic epithelium. Gestational and chronic pyelonephritis of pregnant women is often accompanied by pregnancy complications (pre-eclampsia, risk of pregnancy termination, anemia of the pregnant, placental dysfunction) and complica-



tions with regard to newborn babies (the proportion of premature newborns increases, birth weight decreases, asphyxia becomes more common) [5].

Change in the amount of amniotic fluid is the reason for different obstetric complications in pregnancy: pre-eclampsia, risk of pregnancy termination, anemia of the pregnant, placental dysfunction, along with complications related to delivery — early rupture of the amniotic fluid membrane, foetal distress, abnormal labor activities; complications of postnatal period — uterus sub-involution, subfebrillity, lochiometra; complications in the health status of newborns — the proportion of premature newborns increases, birth weight decreases, asphyxia becomes more common [1; 2].

The course of pregnancy and delivery in case of polyhydramnios is occasionally (15 to 29.7%) complicated by premature or early rupture of amniotic fluid membrane, and, as a result, fall-out of umbilical cord loops or minor parts of the foetus. Perinatal mortality in case of PPRM increases from 6.3 to 18–20% [3; 4]. PPRM pathogenesis in case of polyhydramnios is shown in Fig. 1.

**The objective** is to detect and study risk factors of mortality of newborns born by mothers whose pregnancy was complicated with PPRM in case of polyhydramnios.

### Materials and methods

A survey was conducted with regard to frequency of PPRM development in pregnant women with polyhydramnios, in accordance with the data provided by Vinnitsa City Clinical Maternity Hospital № 2, Vinnitsa City Clinical Hospital “Maternal and Child Health Center”, with the assistance of the department of

obstetrics and Gynecology № 2 of Vinnytsya National N. I. Pirogov Memorial Medical University. 65 delivery histories as well as medical records of newborn development for 2016 were selected for the survey. In the comparison group, PPRM made 8.8% of the total number of deliveries for the period under survey. Pregnancy stage at the time of delivery was 31–41 weeks in the comparison group.

The main group where newborn mortality was registered, was selected from the total number of newborns who were born by mothers with confirmed PPRM cases and polyhydramnios. Delivery histories were analyzed along with medical check-up histories of the pregnant, and medical records of newborn development. Within that group, gestation terms were between 23–30 weeks. Anamnesis data as well as gynecological, obstetrical and extra-genital complications were studied in detail.

Classical methods of mathematical statistics were applied in order to process the results of the clinical and laboratory stud-

ies, along with their analysis and detection of systematic interactions, and assessment of credibility. It was assumed that a typical act of distribution could be applied for study of sampling performance. Reliability of differences in the comparison groups was defined by means of the Student criterion. The results were considered reliable if the quotient of reliability was 0.05 or less.

### The results and their discussion

The analysis made it possible to define population frequency of PPRM in case of polyhydramnios, that was 5.24%. The age of women under the survey was from 17 to 41, while in all the groups most pregnant women were 21–25 years old (49.5%). The women who had polyhydramnios, showed two times higher frequency of genital pathology per woman than the corresponding index in the control group. It was established that there was reliable difference in mothers' age in the groups under study ( $p=0.019$ ), as well as in gestation during childbirth

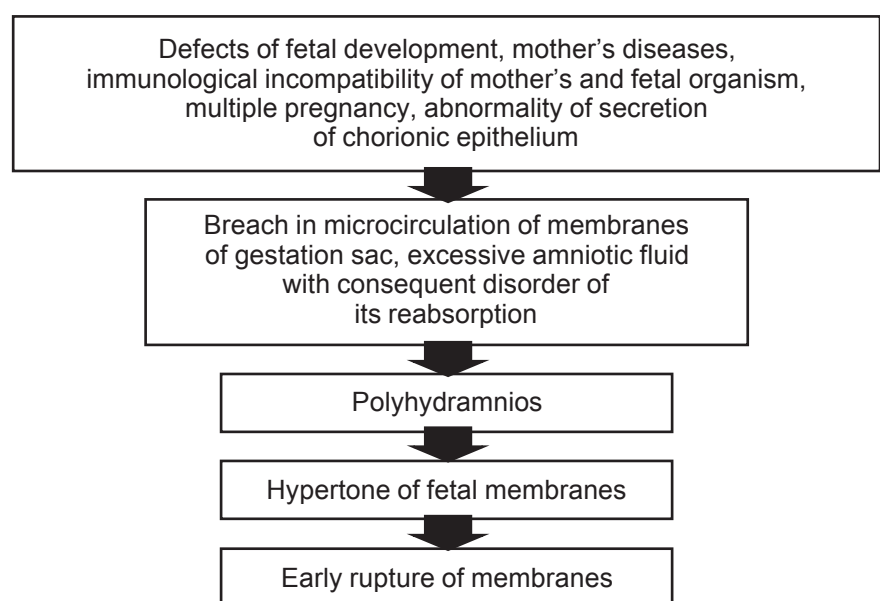


Fig. 1. Premature ruptured membranes pathogenesis in case of polyhydramnios



( $p < 0.001$ ), birth weight ( $p < 0.001$ ), the amount of leukocytes before delivery ( $p < 0.001$ ), the number of pregnancies ( $p = 0.023$ ), duration of latent phase ( $p < 0.001$ ), and also difference in the state of newborns during the first minute ( $p < 0.001$ ) and fifth minute ( $p < 0.001$ ) in accordance with Apgar scale. It should be mentioned that there were not detected any benign diseases of uterus body and hyper-plastic processes in endometrium of pregnant women of the control group, though they were detected in the anamnesis of the pregnant women who had polyhydramnios, and as measured by aggregate, the difference was reliable ( $p < 0.05$ ). Frequency of extra-genital pathology among the pregnant who had polyhydramnios was 1.6 times higher than that of pregnant women from the control group, and made correspondingly 1.06 and 0.65 per woman. Pregnant women with polyhydramnios and PPRM had reliably more frequent cases ( $p < 0.05$ ) of cardiovascular pathology (by 4.8%), with vegetative vascular dystonia ranking first. Microcirculation disorder appear in the system of "mother-placenta-foetus", that causes disorders of secretory and resorptive functions of foetal membranes.

Kidney diseases of pregnant women who have polyhydramnios and PPRM make 20.9% ( $p < 0.05$ ), diseases of digestive tract — 20.6% ( $p < 0.01$ ), sinusitis — 1.6% ( $p < 0.05$ ). Extra-genital pathology is considered to be a significant risk factor that results in development of obstetrical pregnancy complications was rather high against such unfavorable somatic and genital background. Thus, during the 1-st half of pregnancy, acute respiratory viral infections were most frequent — 7.1% ( $p < 0.05$ )

and colpitis — 2.4% ( $p < 0.05$ ). Early gestosis is also frequently found among the pregnant who had polyhydramnios and PPRM (15%), however, there wasn't defined any reliable different as compared to the control group. Such a complication as risk of pregnancy termination was found in the control group more frequently ( $p < 0.05$ ), than it was defined in pregnant women with polyhydramnios and PPRM.

Contrary to the first half of pregnancy, after 200 weeks of gestation, different complications were detected more often. Placental dysfunction (according to the data of ultrasonic screening) was found in 67.6% of women who had polyhydramnios and PPRM, anemia during pregnancy — в 57.3%, colpitis — 37.2%, risk of pregnancy termination — 31.6%, while in the control group these indexes were correspondingly as follows: 18.5, 48.1 and 22.2%. In terms of structure of complications that occur in the second half of pregnancy of women who have polyhydramnios and PPRM, perinatal infections made a considerable percentage (29.6%), as well as hypoplasia of placenta (26.5%), and foetus distress (17.0%).

Such complications as measles, tonsillitis, pneumonia, acute bartolinitis, isthmic cervical insufficiency and placenta breech in the control group were not defined, while women with polyhydramnios and PPRM had isolated cases of such complications. Pregnant women diagnosed with polyhydramnios and PPRM, had more frequent cases of stunting of foetal growth, unstable foetal position ( $p < 0.01$ ); premature birth, risk of pregnancy termination, late gestosis and colpitis ( $p < 0.05$ ). High frequency of pregnancy complications

led to higher frequency of surgical interventions during labor. Such surgical interventions as application of obstetrical forceps, manual revision of uterus walls and manual removal of latter were done only in the groups of pregnant women with polyhydramnios and PPRM. Application of obstetrical forceps was done during five cases of delivery (3.4%) from the second group; reliability of differences as compared to the control group and third group was  $p < 0.05$ . It was foetal distress that became the reason for such intervention.

Three women in birth from the second group (2.0%), due to uterus hypotonia, had postpartum hemorrhage, that was not observed in mothers of the control and third groups ( $p > 0.05$ ). Abnormality of labor activity in the II group of pregnant women with polyhydramnios and PPRM was recorded in 16.2% ( $p < 0.001$ ), and in group III, where prescribed treatment was applied, that index was 9.5% ( $p < 0.05$ ). Premature abruption of correctly located placenta, prolapse of umbilical cord and minor foetal parts were only observed in women from the second group ( $p > 0.05$ ). In the course of examination of pregnant women with a view to detect genital infections, it was found out that associations of micro-organisms during pregnancy of women with polyhydramnios and PPRM were a frequent phenomenon, in contrast to the control group.

Thus, 20.4% of pregnant women from the third group had associations of two micro-organisms, and 24% of pregnant women had such associations of three and more micro-organisms. During the survey, we were detecting disorders in uterine-placental and, more seldom, in foetal-placental blood flow,



along with metabolic disorders in pregnant women who had polyhydramnios and PPRM. Similar disorders are common for placental dysfunction. When urogenital infection was observed during the survey in pregnant women with polyhydramnios and PPRM, specific anti-bacterial therapy was prescribed.

Choice of the antibiotics was determined by pregnancy term and sensitivity of micro-organisms. In case of chlamydia infections and urea-mycoplasmatic infections, jozamicine (vilprafen), or spiramycine (rovamycine) were applied. In case of trichomonas infections, bacterial vaginosis, and genital candidosis, it was more preferable to apply local aetiotropic treatment in the form of ointment applications of 2% clindamycinum cream, miconazol creams, metronidazole gel, and vaginal suppositories with gyno pevaryl, candidibene.

For treatment of viral infections human immunoglobulin was applied, and integrated metabolic therapy. In the course of assessment of newborns' condition in their fifth minute after birth, under Apgar scale, it was detected that 88.1% of newborns were in satisfactory condition in the third group, the corresponding index in the second group was 83.4%. In accordance with the results of assessment of biophysical profile of the foetus, it was found out that satisfactory condition of the foetus in the third group of pregnant women was observed in 50%, which is by 18% more than was observed in pregnant women of the second group. Women who are at risk to develop polyhydramnios and PPRM, should undergo pre-conception training and stay under further dynamic observation.

Pre-conception training includes pregnancy planning, sanitation of chronic sites of infections, assessment of somatic and genetic health of spouses, prevention of acute infection diseases. It is recommended to provide health education for such women in order to promote healthy life style: to avoid hypodynamy, give up bad habits, follow healthy diet. Because of high frequency of genital infection in women with polyhydramnios and PPRM, it is necessary to control micro-biocenosis of the vagina with consequent treatment, if needed. Pregnant women from high risk group must be hospitalized in maternity units when their pregnancy makes 37–38 weeks in order to do complex assessment of foetal-placental functional state, conduct ante-natal training and choose the way of delivery.

Compliance with the above mentioned preventive measures by pregnant women who are at risk to develop polyhydramnios and PPRM, along with correct monitoring of pregnant women with such pathologies can make it possible to reduce perinatal incidence and mortality, and increase the level of population's reproductive health.

**Conclusions.** Risk factors for polyhydramnios include: aggravated obstetric and gynecological, somatic anamnesis and pregnancy complications (exacerbation of extra-genital pathology, placental dysfunction, hypoplasia of placenta, perinatal infections) that lead to increase in percentage of abnormalities of labor activity, premature rupture of membranes, foetal distress, and surgical intervention. Among agents of genital infection, chlamydia, pathogenic staphylococci and trichomonas were most frequently detected. In most cas-

es of moderate idiopathic polyhydramnios, one could observe birth of healthy newborns with body mass of 4000 g, which can be considered as a physiological phenomenon of a big foetus. Women who are at risk to develop polyhydramnios must have training at the stage of pregnancy planning. During pregnancy, they must be further closely monitored and controlled as regards growth of their belly and the position of the uterus bottom; for health reasons such women should have medical genetic consulting and additional ultrasound examination. In the course of delivery, it is necessary to carry out timely amniotomy, prevention of abnormal uterine contractions, and prevention of foetal distress.

**Ключові слова:** фактори ризику, перинатальна смертність, передчасний розрив плідних оболонок, багатоводдя.

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## БІОФІЗИЧНА ХАРАКТЕРИСТИКА КОНДЕНСАТУ ВОЛОГИ ПОВІТРЯ, ЩО ВИДИХАЄТЬСЯ, В ОЦІНЦІ ЕФЕКТИВНОСТІ ЛІКУВАННЯ ТУБЕРКУЛЬОЗУ

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### БИОФИЗИЧЕСКАЯ ХАРАКТЕРИСТИКА КОНДЕНСАТА ВЛАГИ ВЫДЫХАЕМОГО ВОЗДУХА В ОЦЕНКЕ ЭФФЕКТИВНОСТИ ЛЕЧЕНИЯ ТУБЕРКУЛЕЗА

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В работе представлены результаты исследования конденсата влаги выдыхаемого воздуха (КВВВ) методом лазерной корреляционной спектроскопии (ЛКС) у больных туберкулезом легких до и после двухмесячного лечения. Установлено, что ЛК-спектры КВВВ больных туберкулезом существенно отличаются от таких у здоровых лиц и указывают на изменение метаболических процессов, в большинстве случаев — по катаболическому типу с умеренной и высокой степенью выраженности. После курса лечения характер ЛК-спектров изменяется, изменения приобретают анаболический и смешанный тип, степень их выраженности ослабевает.

**Ключевые слова:** конденсат влаги выдыхаемого воздуха, лазерная корреляционная спектроскопия, туберкулез.

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### BIOPHYSICAL CHARACTERISTICS OF THE EXHALED BREATH CONDENSATE IN THE ASSESSMENT OF THE EFFECTIVENESS OF THE TUBERCULOSIS TREATMENT

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This article contains the results of the study of the exhaled breath condensate (EBC) by the means of laser correlation spectroscopy in patients with pulmonary tuberculosis before and after two months of treatment. It was found that the LC-spectra of the TB patients' EBC differ significantly from those in healthy subjects and indicate a shift of metabolic processes, which in most cases is of catabolic type with moderate and high severity. After the treatment the nature of LC-spectra changes. The shifts are of the anabolic and mixed type, and the degree of their severity diminishes.

**Key words:** exhaled breath condensate, laser correlation spectroscopy, tuberculosis.

