

# EMBRYONIC INFECTIONS AS THE MAIN CAUSE OF THE DEATH OF CHILDREN WITH EXTREMELY LOW BIRTH WEIGHT

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## Structured abstract.

**Timeliness:** embryonic infections are one of the most important problems in obstetrics and neonatology. Embryonic infection is diagnosed in 50–65% of hospitalized full-term newborns and more than 70% of premature babies. According to the results of pathological researches of newborns this pathology was the main cause of death in more than 40% of deceased children and it also complicated the course of the underlying disease. **Purpose of the study:** analysis of causes of death of severely premature babies. **Materials and methods of research.** **Methods:** a retrospective analysis of 38 case-record and protocols of pathomorphological studies of severely premature children who were in the NICU from 2016 to 2019 was carried out. The gestational age at the time of birth in the study group was composed as follows: up to 24 weeks - 13 newborns; 25-26 weeks - 51 newborns; 30 weeks - 51 newborns. There are 22 boys and 16 girls in the study group. The average age of mothers of newborns in the study group was over 28 years old, every second one was over 30 years old. 19 of them were first-time-mothers. The aggravating factors were classified into somatic (diseases of the cardiovascular system, chronic diseases of the urinary tract, endocrine diseases, pathology of the gastrointestinal tract) and obstetric-gynecological (medical abortion, spontaneous abortion, early fetal death with delay in the uterus, severe nephropathy). **Results:** the analysis of the postmortem report showed that the main causes of death in severe premature babies are intrauterine sepsis – 16 cases, IVH of III-IV stage caused by DIC amid the congenital infection – 9 cases, severe purulent pneumonia – 7 cases. Congenital pneumopathies amid the congenital infection – 4 cases. In a few cases the main cause of the death was necrotizing enterocolitis, congenital bronchopulmonary dysplasia, fetal neonatal hepatitis with forming hepatic cirrhosis which was developing in utero amid the congenital infection.

According to virological and bacteriological researches the main pathogens at birth were: *Enterococcus faecium* - 4 cases, *Staphylococcus epidermidis* - 4 cases, *Staphylococcus haemolyticus* - 3 cases, *Klebsiella pneumoniae* - 3 cases, *Candida albicans* - 3 cases, *Escherichia coli* - 3 cases case. The conclusion: there were generalized congenital infections of bacterial and bacterial-fungal etiology and IVH varying severity in all cases of death of babies with extremely low body weight. There were accompanying pathologies like congenital infections, DIC, severe anemia, immaturity, extreme prematurity in all cases. As a rule the main reasons for the extremely early termination of pregnancy were the burdened somatic one (diseases of the cardiovascular system - in 10 women (26%), chronic diseases of the urinary tract - 21%, endocrine diseases - in 7 women (18%), a pathology of gastrointestinal tract (5 women), a childbearing pattern (50% of pregnant women) and complications in the pregnancy: a chronic fetoplacental insufficiency – 21 cases (55%), a miscarriage risk – 20 cases (52%), a delayed fetal development – 8 cases (21%), preeclampsia - 5 cases (13%).

**Keywords.** Embryonic infection; Extremely low body weight; Prematurity;

## Relevance.

The intrauterine infections are one of the most important problems in obstetrics and neonatology. The presence of reservoir of infection in a pregnant woman is always a risk factor for the fetus and newborn. The intrauterine infections are detected in 50–65% of hospitalized full-term newborns and more than 70% of premature babies. According to the results of pathological studies of newborns this pathology was the main cause of death in more than 40% of deceased children, and it also complicated the

course of the underlying disease (Chekmareva & Vecherkin, 2017; Kosenchuk et al., 2019; Shevareva, Fedorova, & Nevmerzhitskaia, 2021).

The intrauterine infections have the highest number of death in the structure of early neonatal mortality competing with congenital malformations. Mortality rates from early neonatal sepsis are also quite high and amount to 1-3.5 per 1000 live births, depending on the region (Minullin et al., 2021; Vakhitov, Pikuza, Vakhitova, Zakirova, & Rizvanova, 2019). Morbidity and mortality are much higher in severe premature babies because their anti-infectious properties of

natural barriers and immunological reactivity were weakened (Fowler & Boppana, 2018).

The important factors that cause the development of intrauterine infection and pneumonia in a newborn are the presence of an infectious process in the mother during pregnancy and childbirth, immaturity, low birth weight, premature rupture membranes, chorioamnionitis and etc. (Afonin, Linde, Levkovich, & Levkovich, 2012; Hosono et al., 2015; Lista et al., 2015; Looker et al., 2015). However, the presence of the infection in the mother does not always cause infection in the fetus. The only conditions are the depletion of compensatory-adaptive reactions of all links in a single functional system "mother - placenta - fetus" the infection of the placenta occurs, followed by infection of the fetus (Chekmareva & Vecherkin, 2017; Rybalkina et al., 2017). A placental dysfunction which is the result of the specific action of the infection results in the placenta's inability to be the respiratory and nutritional organs of the fetus, to a violation of its barrier function, which creates the prerequisites for the development of fetal hypoxia, intrauterine growth retardation of the fetus and a decrease in its resistance to infection (Minullin et al., 2021; Pahlitzsch et al., 2017; Subramaniam & Britt, 2018).

The prediction and early diagnosis of intrauterine infection in a newborn is an important area of prevention of perinatal mortality and severe forms of the disease (Coleman & Steele, 2017; Kawasaki, Kosugi, Meguro, & Iwashita, 2017; Lista et al., 2015).

### Purpose of the researches.

Causes of death of severe premature babies.

#### Research methods.

115 babies with extremely low body weight born at 21-30 weeks of gestation, weighing from 490 to 990 grams admitted to the resuscitation and intensive care unit of the perinatal center of the Belgorod Regional Clinical Hospital of St. Joasaph from 2016 to 2019. 38 babies (33%) died. The analysis of 38 case histories and protocols for pathomorphological studies of deeply premature infants who were in the resuscitation and intensive care unit was done by us.

The gestational age at the time of birth in the study group was distributed as follows:

- up to 24 weeks - 13 newborns (11.3%).
- 25-26 weeks - 51 newborns (44.3%).
- 27-30 weeks - 51 newborns (44.3%).

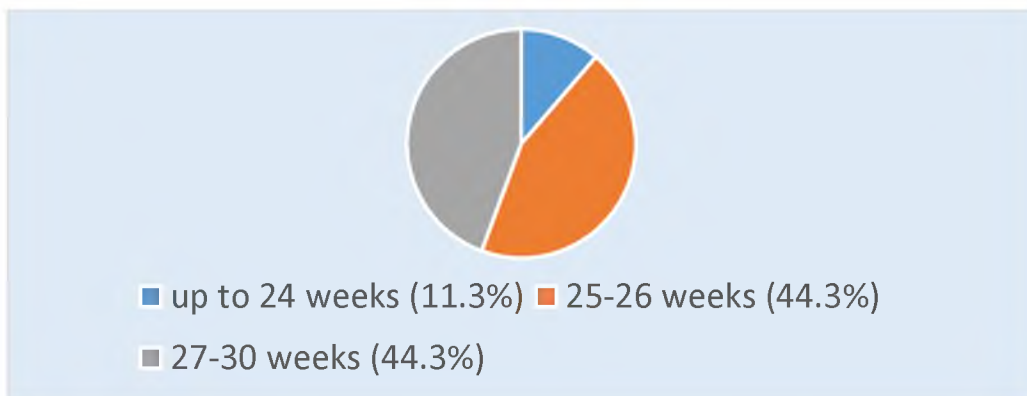


Figure 1. The gestational age at the time of birth in the study group (%)

By body weight, patients were distributed as follows:  
less than 500 grams - 4 children (10.5%).

from 500 to 750 grams - 16 children (42.1%).  
from 750 to 999 grams - 18 children (47.4%).

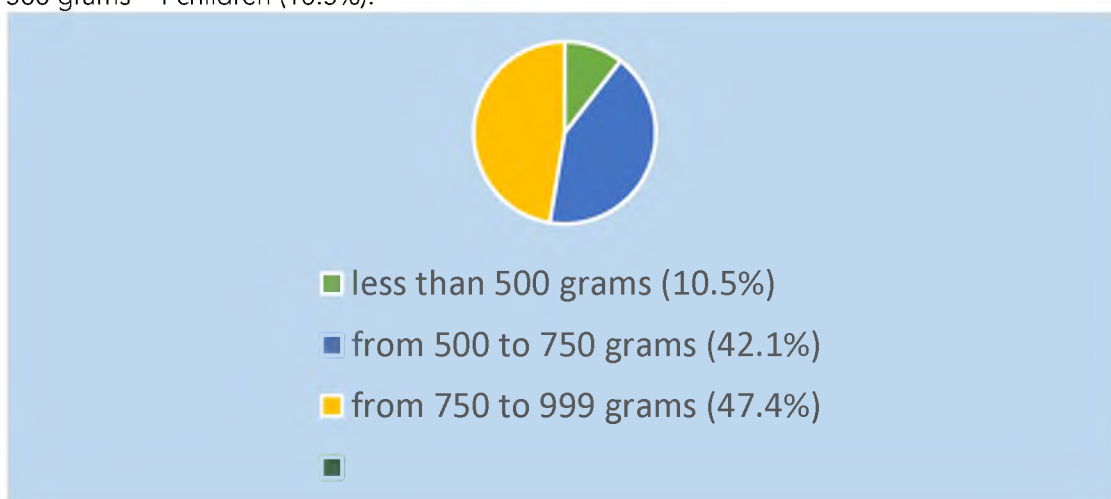


Figure 2. The body weight patients in the study group (%)

There were 22 boys (58%), girls - 16 (42%) in the study group. The average age of mothers of newborns in the study group was over 28 years old, every second one was over 30 years old. Primiparous mothers - 19 (50%).

The factors aggravating the anamnesis were divided into somatic and obstetric-gynecological factors.

Somatic factors:

1. Diseases of the cardiovascular system (mainly arterial hypertension) – 10 women (26%).
2. Chronic diseases of the urinary tract - 8 women (21%).
3. Endocrine diseases - 7 women (18%) (violation of fat metabolism, diabetes mellitus, thyroid diseases).

4. Pathology of the gastrointestinal tract (chronic gastritis, stomach ulcer) 5 women (13%).

Obstetric and gynecological factors:

1. Medical abortion before the birth of children in the study group – 13 women (34%).
2. Spontaneous abortion - 7 women (18%).
3. Early fetal death with delay in the uterus - 6 women (16%).
4. Severe nephropathy - 5 women (13%).

A chronic placental failure – 21 cases (55%), a miscarriage risk – 20 cases (52%), intrauterine growth retardation - 8 cases (21%), preeclampsia - 5 cases (13%) can be attributed to the features of the course of pregnancy in women who gave birth to severe premature babies.

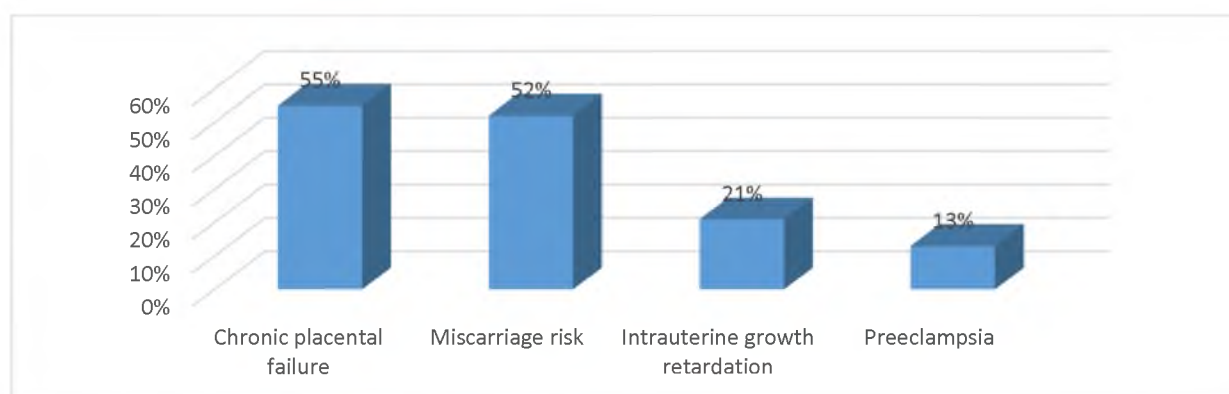


Figure 3. The features of the course of pregnancy in women who gave birth to severe premature babies (%)

The number of caesarean births - 26 cases (69%) in the studied group which

is two times more than independent births - 12 cases (31%). This is due to the presence of absolute indications for caesarean childbirth in women.

33 children were born with severe asphyxia (87%), the rest were born with moderate asphyxia (13%).

Nosological forms in deceased newborns were:

Perinatal CNS involvement – 38 cases (100%), an intraventricular

hemorrhage was diagnosed in 18 newborns (47.4%), in 11 of them (29%) - III-IV stage, in 5 (13.1%) - periventricular leukomalacia.

A respiratory distress syndrome was observed in all 38 deceased newborns

(100%), of whom 37 (97.3%) were diagnosed with severe respiratory distress syndrome, and because of that all patients were on mechanical ventilation. Respiratory distress syndrome was combined with intrauterine pneumonia in all 38 cases (100%).

Multiple organ failure developed in the majority of deceased children – 32 children (84.2%).

The frequency of DIC syndrome is 32 children (84.2%).

Severe anemia was formed in 32 deceased children (84.2%), the rest was not diagnosed because they lived less than 7 days.

## Research results.

The analysis of the postmortem reports showed that the main causes of death of severe premature babies are:

1. Intrauterine sepsis – 16 cases (42.1%)
  2. IVH of III-IV stage caused by disseminated intravascular coagulation syndrome amid the congenital infection – 9 cases (23.7%)
  3. Serous-purulent pneumonia – 7 cases (18.4%).
  4. Congenital pneumopathies on the background of the congenital infection – 4 cases (18.4%).
  5. In several cases the main cause of death was necrotizing enterocolitis, congenital bronchopulmonary dysplasia, fetal giant cell hepatitis with developing cirrhosis of the liver which developed in utero amid the congenital infection.
- According to virological and bacteriological researches the main pathogens at birth were: Enterococcus faecium – 4 cases, Staphylococcus epidermidis - 4 cases, Staphylococcus haemolyticus – 3 cases, Klebsiella pneumonia – 3 cases, Candida albicans – 3 cases, Escherichia coli – 3 cases case.

Accordingly, the developing of the uterine infections was detected in 100% of cases which is considered as the natural process considering the almost total infection of women and primary immunodeficiency in severe premature babies. The

diagnosis of intrauterine pneumonia was detected in 100% of cases, congenital conjunctivitis – in 36 babies (94.7%), necrotizing enterocolitis – 21 (55.2%), fetal hepatitis – 6 cases (15.8%).

## Conclusion.

1. In all cases of death of children with extremely low body weight (100%) generalized congenital infection of bacterial and bacterial-fungal etiology were detected.
2. All 38 babies (100%) of the study group had clinical and pathological signs of CNS lesions of varying severity.
3. As a rule the main reasons for the extremely early termination of pregnancy were burdened somatic (diseases of the cardiovascular system - in 10 women (26%), chronic diseases of the urinary tract - 21%, endocrine diseases - in 7 women (18%), pathology gastrointestinal tract - in 5 women) and obstetric history (in 50% of pregnant women), and also the complications in the pregnancy.: CPFI - 21 cases (55%), a miscarriage risk - 20 cases (52%), FGR - 8 cases (21%), preeclampsia - 5 cases. (13%).

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