

## Analysis risk factors for preterm births in children under care of the Department of Pediatric Rehabilitation in Bialystok

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### ABSTRACT

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**Introduction:** Preterm birth is the birth of a baby at fewer than 37 weeks' gestational age. Preterm infants are at risk for numerous medical problems including neurological, cardiological, respiratory, and infection.

**Purpose:** To analyse the selected risk factors of preterm births among children under the care of the Department of Pediatric Rehabilitation in Bialystok

**Materials and methods:** The retrospective study included 96 preterm children with very low body mass less than 1500 grams. All children lived in the Podlasie region of Poland. We analysed the risk factors for preterm birth based on the medical files. The detailed interview included: the course of pregnancy, diseases before pregnancy, the prevalence of genetic diseases in the nearest family, and the earlier miscarriages.

**Results:** The intrauterine infection (20 cases), fetal distress, (19 cases), uterine bleeding (15 cases),

multiple pregnancies (13 cases) were the most often risk factors of preterm births. Only a few cases concerned congenital toxoplasmosis and cytomegaly, malformation of the reproductive system, mother diseases during the pregnancy. The gender of the child did not determine the preterm birth. A significant correlation between preterm birth and the sequence of pregnancy preterm birth was related with first pregnancy in 47% of cases. There was no correlation between i. body mass and sex, ii. earlier miscarriages and preterm births.

**Conclusions:** The risk factors of preterm births are diverse. Most common causes of preterm births were the intrauterine infection, fetal distress, and uterine bleeding.

**Keywords:** Preterm birth, risk factors, very low body mass, intrauterine infection

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## INTRODUCTION

According to the World Health Organization (WHO), a child born after the 22nd week of pregnancy and before the 37th week is considered a newborn premature. Data show that over 500,000 premature births occur in the European Union every year. In 2012, the percentage of premature births ranged from 5%-8%. In Poland about 5.8% of children were born prematurely [1,2].

Premature birth is the cause of perinatal morbidity and mortality. From 60%--70% of deaths of newborns born without anatomical and chromosomal abnormalities result from low birth weight and are the result of immaturity. In newborns of less than 1,500 g, a 200-fold higher risk of death in the first year of life is observed compared to newborns weighing more than 2,500g. Prematurity increases by ten times the risk of neurological disorders, delays in psychomotor development, visual and hearing impairments and chronic lung disease [1,2].

The reduction in the neonatal mortality rate and the effects of prematurity through stress on preventive measures is now a social need [1,2]. The program is designed to reduce the incidence of prenatal illness, pregnancy and childbirth, and to eliminate risk factors for preterm delivery, as well as to organize the hospitalization of women with pregnancy at risk in specialized pregnancy pathology departments. Particular emphasis was placed on the early identification of women at risk of premature delivery. This group of women should be directed to perform extended and detailed diagnostics [1,2].

Expenditures incurred for the implementation of the program are lower in relation to the costs of treatment of the effects resulting from prematurity. Treatment of complications due to prematurity results only when using the latest knowledge and medical technology [1-3].

Prematurity in Poland is the most common cause of deaths (47%), compared with newborns with developmental defects (24%), respiratory diseases (8%) and infectious and parasitic diseases (8%) [2].

The risk factors for preterm delivery include [1,2]:

- low socioeconomic status
- age of mother <18-year and over 40 years of age
- harmful working conditions
- multiple pregnancy
- history of preterm birth
- spontaneous abortions in the second trimester of pregnancy in an interview
- sexually transmitted diseases
- high-risk pregnancy due to maternal diseases (e.g. epilepsy, diabetes)
- hypertension, kidney and heart disease
- drug addiction, alcoholism, and nicotine
- insufficient prenatal care [2].

The factor of pre-term delivery may be developmental disorders and fetal diseases, which include chromosomal abnormalities, congenital malformations, suppression of intrauterine growth and development, anemia and edema in the course of serological conflict [3-11].

Epidemiological and clinical data indicate that intrauterine infections are the cause of premature labor [12]. Also, generalized infections during pregnancy pose a risk of premature delivery. Traditional methods of preventing premature births involving the use of tocolytic drugs are widely used [13]. The most appropriate procedure would be to prevent premature delivery [12,14,15]. Studies on epidemiology and pathophysiology of preterm birth indicate the four main mechanisms leading to preterm delivery are inflammation, bleeding, excessive uterine extension and premature stimulation of physiological factors initiating delivery [16]. Prevention of premature delivery should be multistage; prevention methods should result from the recognition of a multifactorial etiopathogenesis of premature termination of pregnancy [12,14,17].

The aim of the study was to analyse the risk factors for premature birth in the material of the Department of Pediatric Rehabilitation of the Medical University of Bialystok, Poland

## MATERIALS AND METHODS

The research included 96 prematurely born children with a weight below 1500g. with gestational age less than 37 weeks at birth. All children are under the care of the Rehabilitation Clinic in Bialystok and living in the Podlaskie region. The study was conducted among children born between January 1 2012 and December 31 2016. Detailed information on the causes of premature labor was obtained on the basis of the analysis of medical records (pregnancy histories and information cards from the course of labor) and the interview.

Statistical calculations of the influence of the child's sex, the order of births and earlier miscarriages on pre-term labor were made. The Chi<sup>2</sup> independence test was used for statistical calculations. In the calculations, the significance level  $p < 0.05$  was considered to be statistically significant. Statistical analyses were conducted using SPSS Statistics V 21.0 (Armonk, NY: IBM Corp.) statistical package.

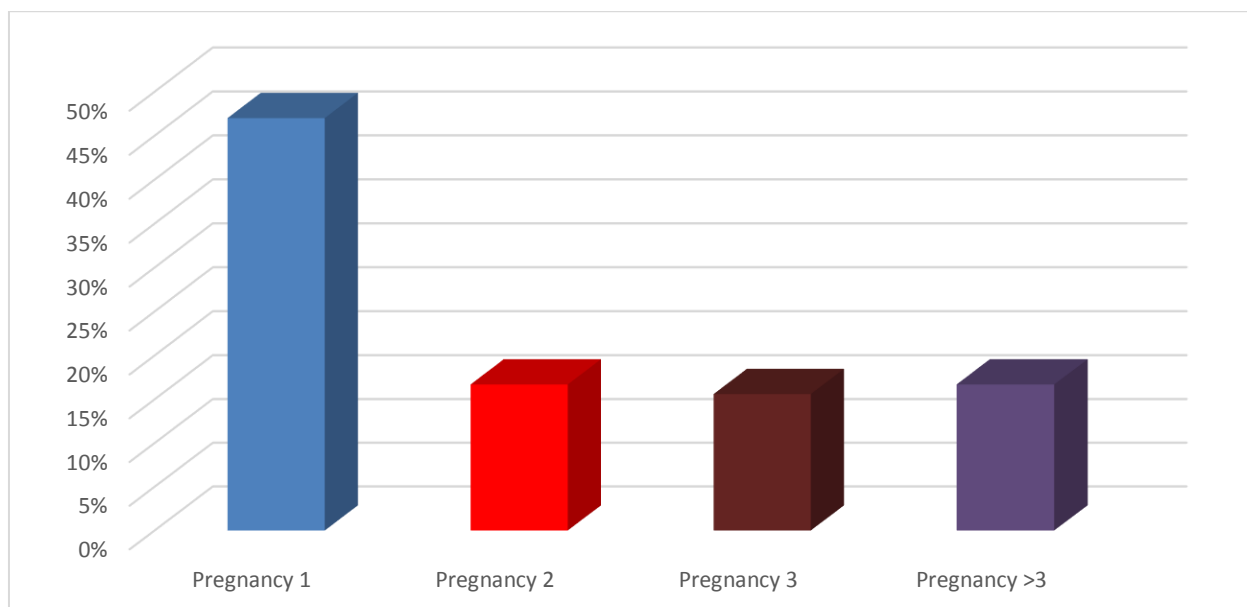
## RESULTS

In the study group N=96, all children were born with a weight below 1500g. Female gender was 43 cases (45.0%), male gender 53 cases (55.0%).

There was no significant difference between the number of girls and boys  $p > 0.05$ .

About half (47.0%) of newborns born prematurely were from the first pregnancy, 16 (16.7%) - from the second pregnancy, 15 (15.6%) from the third pregnancy, 16 (16.7%) - from the following pregnancy. A significant relationship was found between premature delivery and the child's

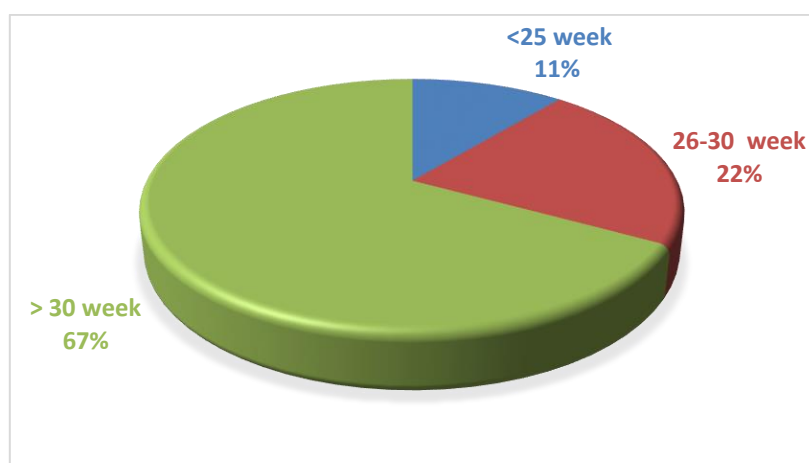
birth order. In 47% preterm delivery occurred in the first pregnancy ( $p < 0.05$ ) (Figure 1).



**Figure 1.** The sequence of pregnancies in children born with a body weight below 1500g

In the study group, 24 (25%) mothers had previous spontaneous abortions below 22 weeks of gestation. Half of the births (51.0%) were delivered by Cesarean section, the remaining 47 (49%) were vaginal. There was no significant relationship between preterm delivery and multiple pregnancy. Among the group of 96 prematurely born children with a weight of <1500g, multiple pregnancies accounted for 13 (13.6%).

In the group of babies born less than 25 weeks gestation were 11 (11.0%) infants in the range of 26 - 30 weeks of pregnancy were born 64 children (67.0%), more than 30 weeks pregnant occurred in 21 cases (22.0%). Premature delivery usually occurred between 26 and 30 weeks (Figure 2).



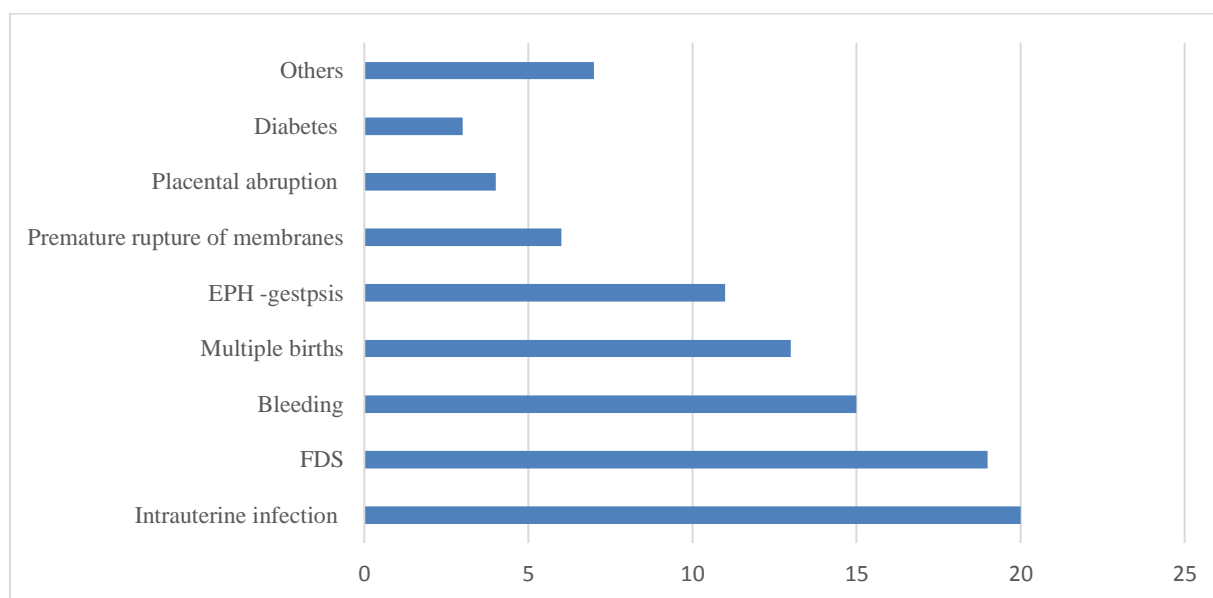
**Figure 2.** Weeks of childbirth in children born with a body weight below 1500g

Less than half 39.0% of children were born with a weight below 1000g, and 61% of children were born in the weight range of 1000g - 1500g. There was no significant relationship between the sex of the child and birth weight ( $p > 0.05$ ). The lowest birth weight was 490g and the highest 1500 g.

In the examined group of prematurely born children  $N = 96$ , the most common cause of premature delivery was the intrauterine infection - 20 cases, which is 20.8% of the subjects. The second significant cause of pre-term labor FDS - fetal distress - 19 (19.8%) cases. In 15 cases (15.6%) the

reason for terminating the pregnancy was bleeding from the genital tract. Multiple births were noted in 13 (13.5%), and EPH-gastrosis was found in 11 (11.45%) cases. In 6 (6.25%) cases there was premature rupture of membranes. Details are shown in Figure 3.

Birth asphyxia was found in 84 newborns (87.5%), RDS - Respiratory Distress Syndrome was found in 39 children (40.6%) and sepsis in 11 (11.4%). Intraventricular hemorrhages were found in 6 (6.25%) cases, and retinopathy was diagnosed in 7 cases (7.3%). In individual cases, toxoplasmosis and cytomegalovirus were noted.



**Figure 3.** Causes of premature births

## DISCUSSION

In the examined group of 96 cases, the method of termination of pregnancy did not differ significantly in the statistical way, in 49 (51%) cases ended by cesarean section and in 47 (49%) cases these were births of roads and forces of nature. The most common indication for cesarean section is the threatening intrauterine ICD [12]. Cesarean section should not be routinely recommended in deliveries prior to week 28 of pregnancy. Many obstetricians believe that the way of termination of pregnancy has an impact on mortality and perinatal complications in newborns born prematurely. The results of the study provide divergent data on the relationship between the way of terminating the pregnancy and infant mortality, especially of very low birth weight [3,23,188, 23]. Delivery by cesarean route is associated with a higher risk of complications and death of the mother. The study shows that cesarean section does not statistically significantly reduce

complications such as intrauterine infection, respiratory distress syndrome or intraventricular hemorrhage in newborn infants with low mass [1,2,12]. According to the Neonatological Care Report of Prematurity in Mazovia, the percentage of preterm delivery by cesarean section was 60% (data from 2008-2012). In cases of extremely low birth weight <750g in 70% of cases, the cesarean section resulted in better survival but did not affect the rate of future developmental disorders [2].

In the study group, 96 cases of intrauterine infection was found in nearly 20% of cases and were the most important risk factor for preterm birth. Pregnancy infections are now diagnosed and treated effectively, but if left untreated, they pose a serious threat to both the mother and the fetus. Testing by seeding is to reflect the state of the genitourinary system and possible elimination of the pathogen [4,24]. Symptoms of bacterial vaginosis and yeast vaginosis require appropriate treatment [3,17,18,19]. Positive bacteriological cultures from the cervical

canal are only an indirect source of information about the risk of preterm labor [3,18]. The studies of patients who gave birth prematurely only in 29.7% of cases were positive results of bacteriological tests (including 44% of *Candida albicans* strains). The authors suggest that the presence of bacteria is not a factor significantly increased the occurrence of premature labor [3].

In the current study, the third most frequent cause of premature delivery was bleeding from the genital tract. According to obstetricians, bleeding may be the cause of premature labor due to cervical dilatation or the existence of pathology associated with the placenta [3,5]. In the case of the placenta, the physician decides, depending on the time, the amount of bleeding and the general state of the mother, as well as in the case of fetal abnormalities [3].

The risk factors for preterm delivery include the multiple pregnancies. In the study group, multiple births were found in 12.5% of cases [6]. The presence of multiple births causes excessive uterine prolapse and may result in the premature elimination of the fetal water and premature uterine contractile function [3,6,25]. In a Zamłyński et al. study [26], premature births in twin pregnancies related to 85% of cases. Premature delivery was influenced by a significantly higher incidence of gestational-induced hypertension and cholestasis [3,26]. In

30.0% of cases, the reasons for preterm delivery are unknown [6]. Pregnancy pathologies can be revealed and deepened in subsequent stages of pregnancy [5]. The obstetric problems include: bleeding from the genital tract, abnormalities in the placement and placement of the placenta, cervical insufficiency, premature systolic function, oligohydramnios, and polyhydramnios. Pregnant maternal factors include gestational diabetes, cholestasis, pregnancy-induced hypertension, EPH-gastosis and blood coagulation disorders [5,6].

In the present study, in 19 (19.8%) cases the pregnancy was terminated due to fetal distress. Fetal distress refers to the presence of signs in a pregnant woman before or during childbirth—that suggest that the fetus may not be well. There are several causes of fetal distress including abnormal position and presentation of the fetus, multiple births, umbilical cord prolapse, and placental abruption [6].

In the examined group, in 11 (11.5%) cases, premature delivery was caused by the occurrence of EPH-gestosis. When suspected of EPH-gestosis or delayed growth of the fetus, Doppler assessment of uteroplacental-fetal perfusion is recommended. This examination determines the quality of the flow in the uterine arteries and the artery and umbilical vein and artery of the middle brain of the fetus. This method allows early detection of fetal distress and allows the use of appropriate treatment [9-11]. In single cases, toxoplasmosis, cytomegalovirus, glomerulonephritis, maternal nephrolithiasis, congenital hydroce-

phalus in the fetus and diabetes mellitus have been confirmed. This indicates a wide variety of factors causing the occurrence of premature birth.

The incidence of hypertension during pregnancy is 7.0% -10.0%, which is associated with the risk of premature birth, perinatal complications and the risk of death of both the child and the mother [26]. In the examined group hypertension as a reason for premature delivery occurred in 4 cases.

Hypertensive disorders of pregnancy remain an unresolved and unpreventable problem in obstetrics. Hypertension in pregnant women may occur in gestational diabetes or urinary tract infection. Untreated hypertension can lead to pre-eclampsia, which may lead to maternal death and fetal death [27].

The issue of preterm delivery is a challenge for modern obstetrics and is of interest to many researchers, both in Poland and in the world. Despite the development of prenatal medicine and care, the prevalence of preterm delivery remains at the same level for many years. Multifactorial causes are bearing the risk of premature labor cause difficulties in the development of preventive methods and effective counteracting them [3,19,20,21,28,29].

The current study includes a rather small sample size, so further studies on a larger population are needed.

## CONCLUSIONS

In the examined group of prematurely born children among the maternal factors was the most common cause of premature delivery was the intrauterine infection, fetal distress, and bleeding from the genital tract. Birth asphyxia, Respiratory Distress Syndrome, and sepsis were noted more often in prematurely born children with birth weight below 1500g.

## Conflicts of Interest

The authors declare that there are no conflicts of interests regarding the publication of this study.

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