Original article

Neurodevelopmental Outcomes of Very Low Birth Weight Preterm Infants in The Regional Pediatric Clinic

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Abstract

Aim: To examine the incidence and etiology of neurodevelopmental outcomes in very low birth weight preterm infants, maternal and perinatal risk factors, comorbidities, and clinical presentation and compare with newborns of the same gestational age who did not develop a neurodevelopmental disorder.
Methods: The research was conducted at the Pediatric Clinic in KBC (Clinical Hospital Center) Osijek. All newborns born from 1 January 2018 to 31 December 2019 with birth weight < 1,500 g and gestational age < 37 weeks are included in the research. The data were collected by reviewing medical records and the hospital's IT system.
Results: In the observed period, 120 children with birth weight < 1,500 g and gestational age < 37 weeks were born. Maternal and perinatal risk factors for premature birth include autoimmune diseases of the mother, infections during pregnancy and birth complications. Early complications that accompany the selected group are RDS, ROP, NEC, IVH, sepsis, congenital heart defects and glucose metabolism disorder. Slowed motor, cognitive and speech development are mostly influenced by low body weight, higher degree of IVH, lower AS in the first minute and the presence of NEC. Significant risk factors for death are gestational age < 25 weeks, body weight < 800 g, infections in pregnancy and autoimmune diseases of the mother.
Conclusion: The neurodevelopmental outcome of very low birth weight preterm infants depends on a combination of comorbidities, as well as maternal, perinatal and neonatal risk factors.

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Introduction

Definition

Very low birth weight (VLBW) infants refer to infants born before 37 weeks of gestation with a birth weight of less than 1,500 g. VLBW infants are more prone to develop morbidities throughout life, including cerebral palsy (CP), cognitive delays, psychomotor delay, blindness, deafness and other chronic diseases. The incidence of VLBW varies globally, with approximately 11.5% in underdeveloped countries and 9.3% in middle to high-income countries. In Croatia in 2021, out of 36,991 births, 2,500 were preterm and 13% of preterm births were VLBW infants (1).

The etiology of preterm births is multifactorial, with 50% being unknown, and the other half being attributed to factors such as maternal disease, age, obstetric and placental complications, fetal anomalies, etc. (2).

Short-term complications of prematurity

Due to their physiological and anatomical characteristics and functional immaturity, preterm infants are at higher risk of both short-term and long-term complications. The most common short-term complications include respiratory distress syndrome (RDS), necrotizing enterocolitis (NEC), retinopathy of prematurity (ROP), bronchopulmonary dysplasia (BPD), early-onset sepsis, intraventricular hemorrhage (IVH) and periventricular leukomalacia (PVL).

Neurodevelopmental complications

Neurodevelopmental disorders can be divided into low-risk (speech, communication, behavior and learning disorders) and high-risk groups (mental retardation, epilepsy, CP). Research indicates that 30–60% of VLBW children show neurological deficits, with 10–15% developing CP. CP is a group of non-progressive movement and posture disorders caused by damage to the immature brain. The world's prevalence ranges from 2.0 to 2.8 per 1,000 live births. In Croatia, in 2022, there were 24,698 individuals with CP and other paralytic syndromes. The incidence of CP has increased by over 20%, which is linked to improved survival of VLBW infants, representing 35% of CP cases (2, 3).

Diagnosis

The diagnosis of neuromotor deviations involves clinical examination, radiological diagnostic methods, evoked potentials, psychological and speech therapist evaluations and others.

Brain ultrasound (US) has become the gold standard in diagnosing perinatal brain damage, offering high predictive value for neurodevelopmental deviations. The outcome depends on the location, size and type of lesion.

Common findings include IVH and PVL. The incidence of periventricular-intraventricular hemorrhage is inversely proportional to gestational age, with an overall incidence of 15 to 40%, and for VLBW infants, it is 25%. Another US-significant finding is PVL: a symmetric infarction of white matter, i.e. hypoxic-ischemic damage in the border zones of vascular supply. The incidence ranges from 4 to 7% with long-term consequences in 35–90% of cases (4).

Treatment

A multidisciplinary approach is the preferred therapy adapted to the individual based on the clinical presentation and therapeutic possibilities (5). The goal is to re-establish the function of damaged areas of the central nervous system based on brain neuroplasticity (6). The most common are Bobath, Vojta, medical gymnastics, baby handling, sensory integration and supportive pharmacotherapy for CP.

Participants and methods

All live-born infants born in the period from 1 January 2018 to 31 December 2019, at the Department of Pediatrics, Clinical Hospital Center Osijek, were included in the study. A total of 120 infants of both genders were enrolled. The inclusion criteria for participants were birth weight < 1,500 g and gestational age < 37 weeks. Exclusion criteria were infants with birth weight > 1,500 g, gestational age > 37 weeks, as well as

newborns who received palliative care immediately after birth.

Data were collected by reviewing the medical documentation and the hospital information system. The collected information included perinatal, neonatal and postnatal risk factors, comorbidities, information about the child's condition, laboratory characteristics in the first 72 hours of life, parameters of mechanical ventilation, the occurrence of neurodevelopmental abnormalities at the age of three and treatment options.

Results

In the observed period, at the Clinical Hospital Center Osijek, 3,754 children were born, of which 120 were VLBW preterm infants, constituting an incidence of 3.19%. The study involved 110 mothers and 120 preterm infants. Early perinatal characteristics of preterm infants are presented in Table 1.

Table 1. Early perinatal characteristics of preterm infants with a birth weight below 1,500 g (n = 120)

	Number of infants	Median (IQR)	Minimum - Maximum
Gestational age (weeks)	120	28+6 (25+3 to 31+2)	22–36
Birth weight (g)	120	1,066 (763–1,347.8)	400–1,499
Length (cm)	120	36 (32–39)	22–43
Apgar 1'	120	6 (3–9.8)	0–10
Apgar 5'	120	8 (6–10)	1–10

n – number, IQR – interquartile range, g – gram, cm – centimeter, Apgar 1' and 5' – Apgar at 1 minute and 5 minutes

Table 2. Interventions and procedures during the stay of preterm infants with birth weight below 1,500 g (n = 120)

	Number of kids	Median (IQR)	Minimum – maximum
Incubator (days)	120	24 (11–40)	1–109
O2 (days)	120	22 (8.3–40.8)	1–115
Infusion (days)	115	11 (6–24)	1–90
Phototherapy (hours)	118	10 (0–22.5)	0–60
Non-invasive support [n = 88 (73.3%)]			
Duration of non-invasive support (days)	88	11 (5–23)	1–51
Invasive support [n = 54 (45%)]			
Duration of invasive support (days)	54	6.5 (2–15)	1–66
Additional oxygenation (days)	90	19 (12–25)	4–45
Maximum % of oxygen during additional oxygenation	90	30 (30–30)	20–40
Total oxygenation (days)	119	26 (12–46)	0–126

O2 – oxygen, n – number, IQR – interquartile range

All preterm infants required care in an incubator for a period ranging from 1 to 109 days, with a median of 24 days. Oxygenation was necessary for all infants, and they received oxygen for 1 to 115 days, with a median of 22 days. Infusion with glucose-electrolyte support was provided for a period ranging from 1 to 90 days, with a median of 11 days. Due to the occurrence of

hyperbilirubinemia, 118 (98.3%) preterm infants received phototherapy for a duration of up to 60 hours, with a median of 10 hours. Mechanical ventilation was used as a means of respiratory support for most participants: 88 (73.3%) received non-invasive respiratory support for a duration of 1 to 51 days, and 54 (45%) received invasive support for a duration of 1 to 66 days (Table 2)

Out of early complications, RDS was present in 96 (80%) preterm infants, 65 infants had IVH: 10 with 1st degree, 32 with 2nd degree, 20 with 3rd degree, 3 with 4th degree and 20 with 5th (leukomalacia). ROP was present in 44 (36.7%) preterm infants, most commonly found in Zone 2. NEC occurred in 31 (25.8%) preterm infants, and 5 (4.2%) preterm infants did not survive. Most cases were grade 1A. Early sepsis was present in 48 (40%) preterm infants, while late sepsis occurred in 40 (33.3%). Isolated bacterial cultures included MRSA, Streptococcus/Enterococcus and Pseudomonas/E. coli/Morganella. Among neurological abnormalities, CP was present in 5 (4.2%) preterm infants, seizures in 15 (12.5%) preterm infants, and high neuro-risk children constituted 12 (10%) cases.

Eleven (9.9%) mothers had gynecological diseases. Hematological disorders were present in 8 (7.5%) mothers, of whom 7 out of 8 had anemia. Autoimmune diseases were recorded in 38 (34.4%) mothers, infections during pregnancy in 37 (33.6%) of them, and six (5.4%) mothers had other diseases. Fatal outcomes occurred in 30 (25%) preterm infants, mostly with extremely low birth weight and gestation, with a median weight of 613 g and low Apgar scores (AS) at 1 and 5 minutes. The median time to death was 3 days.

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Table 3. Characteristics of premature infants with fatal outcomes compared to survivors

	Survived (n = 90)	**Died (n = 30)**	*P*
Birth weight (grams) [Median (IQR)]	1,199.5 (915–1,427)	613 (504.3–807.3)	**<0.001‡**
Apgar 1' [Median (IQR)]	8 (5–10)	3 (2–5)	**<0.001‡**
Apgar 5' [Median (IQR)]	9 (7–10)	5 (2–7)	**<0.001‡**
Number of days until death [Median (IQR)]	-	2 (1–8)	-
Corticosteroids [n(%)]	61 (68)	17 (57)	0.27*
Surfactant [n(%)]	50 (56)	7 (23)	**0.04***
Mechanical ventilation [n(%)]			
Invasive	43 (48)	11 (37)	0.29*
Non-invasive	85 (94)	3 (10)	**<0.001***
Chromosomal abnormalities [n(%)]	8 (9)	5 (17)	0.31*
Mothers' infections [n(%)]	32 (36)	15 (50)	0.16*
Mothers' autoimmune disease [n(%)]	24 (27)	10 (33)	0.49*
Brain US (n=12) [n(%)]			
I degree of IVH			
II degree of IVH	13 (16)	1 / 12	**0.001‡**
III degree of IVH	33 (41)	4 / 12	
IV degree of IVH	14 (17)	4 / 12	
IV degree of IVH	0	3 / 12	
V degree (leukomalacia)	21 (26)	0	

Apgar 1', 5' – Apgar sum at 1 minute and 5 minutes, US – ultrasound, g – grams, n – number, IQR – interquartile range *Chi-square test; ‡Fisher's exact test; ǂMann-Whitney U test

Seventeen (57%) of them received corticosteroid therapy, and 11 (37%) were on invasive mechanical ventilation. Chromosomal abnormalities were noted in 5 (17%) cases, mother's infection in 15 (50%) and autoimmune disease in 10 (33%) cases. Four out of twelve preterm infants had grade II or III IVH (Table 3).

There are no significant differences in neurodevelopmental outcomes and comorbidities in preterm infants with a birth weight below 1,500 g concerning maternal diseases during pregnancy (Table 4)

Table 4. Neurodevelopmental outcomes and comorbidities in preterm infants with a birth weight below 1,500 g concerning maternal diseases during pregnancy

	Number (%)			*P*
Motoric development	**Delayed**	**Average**		
Infection in pregnancy	10 (40)	20 (32)		0.49*
Mothers' autoimmune disease	5 (20)	18 (29)		0.39*
Number of drugs in pregnancy				
One	3 (15)	6 (11.3)		0.92†
Two	3 (15)	9 (17)		
Two or more	14 (70)	38 (71.7)		
Corticosteroids	16 (64)	42 (48)		0.80*
Antibiotics	9 (36)	34 (54)		0.16*
Speech	**Delayed**	**Average**	**Does not speak**	
Infection in pregnancy	12 (44)	17 (30)	1 / 2	0.32†
Mothers' autoimmune disease	7 (26)	14 (25)	1 / 2	0.68†
Number of drugs in pregnancy				
One	3 (13)	5 (10.4)	1 / 2	0.53†
Two	3 (13)	9 (18.8)	0	
Two or more	17 (73.9)	34 (70.8)	1 / 2	
Corticosteroids	6 (22)	15 (26)	1 / 2	0.60†
Antibiotics	11 (41)	31 (54)	1 / 2	0.67†
Convulsions/ epilepsy	**No**	**Yes**		
Infection in pregnancy	40 (38)	7 (47)		0.53*
Mothers' autoimmune disease	31 (29)	3 (20)		0.55*
Number of drugs in pregnancy				
One	11 (12.6)	1 (7.7)		0.91†
Two	18 (20.7)	2 (15.4)		
Two or more	58 (66.7)	10 (76.9)		
Corticosteroids	68 (65)	10 (67)		>0.99†
Antibiotics	55 (52)	7 (47)		0.79†
Cognitive development	**Delayed**	**Average**		
Infection in pregnancy	11 (44)	19 (31)		0.32*
Mothers' autoimmune disease	5 (20)	17 (28)		0.59*
Number of drugs in pregnancy				
One	2 (9.5)	7 (13.5)	9 (12.3)	0.92†
Two	3 (14.3)	9 (17.3)	12 (16.4)	
Two or more	16 (76.2)	36 (69.2)	52 (71.2)	
Corticosteroids	19 (76)	39 (64)		0.32*
Antibiotics	10 (40)	33 (54)		0.34†

*χ^2 test; †Fisher's exact test

Delayed motor development is seen in infants with lower birth weight (P = 0.03), lower AS at the first minute (P = 0.04) and a significantly higher incidence of NEC (P = 0.02). Delayed speech is significantly associated with lower birth weight (P = 0.03) and the presence of NEC (P = 0.04). Seizures are significantly more common in preterm infants with NEC (P = 0.001) and a higher degree of IVH (P = 0.008).

Table 5. Neurodevelopmental outcomes and comorbidities in preterm infants with birth weight below 1,500 g in relation to perinatal risk factors

	Number (%) of infants			*P*
Motor development	**Delayed**	**Average**		
Birth weight (grams) [Median (IQR)]	1,024 (780–1,308)	1,229 (1,037–1,481)		**0.03‡**
Apgar 1' [Median (IQR)]	6 (4–9)	9 (5–10)		**0.04‡**
Apgar 5' [Median (IQR)]	8 (7–10)	9 (8–10)		0.07‡
Early sepsis	10 / 10	27 (87)		0.56†
Late-onset sepsis	14 / 14	22 (96)		>0.99†
NEC	11 (48)	12 (21)		**0.02***
Jaundice	5 (20)	24 (38)		0.09*
Brain US [n(%)]				
I degree of IVH	1 (4.8)	11 (19)		0.33†
II degree of IVH	9 (42.9)	23 (39.7)		
III degree of IVH	3 (14.3)	11 (19)		
V degree (leukomalacia)	8 (38.1)	13 (22.4)		
Speech	**Delayed**	**Average**	**Does not speak**	
Birth weight (grams) [Median (IQR)]	1,070 (760–1,241)	1,217 (985–1,491)	1,340 (882–1,130)	**0.03§**
Apgar 1' [Median (IQR)]	7 (5–9)	9 (5–10)	9 (7–10)	0.06§
Apgar 5' [Median (IQR)]	8 (7–10)	9 (7–10)	10 (10–10)	0.22§
Early sepsis	10 / 12	26 (93)	0	0.57*
Late-onset sepsis	17 / 17	18 (95)	0	>0.99*
NEC	12 (46)	11 (20)	0	**0.04†**
Jaundice	8 (30)	20 (35)	0	0.74†
Brain US [n(%)]				
I degree of IVH				
II degree of IVH	2 (9.1)	10 (18.5)	0	0.19†
III degree of IVH	8 (36.4)	22 (40.7)	1 / 2	
IV degree of IVH	2 (9.1)	12 (22.2)	0	
V degree (leukomalacia)	10 (45.5)	10 (18.5)	1 / 2	
Convulsions/ epilepsy	**No**	**Yes**		
Birth weight (grams) [Median (IQR)]	1,106 (780–1,368)	825 (660–1,024)		0.07‡
Apgar 1' [Median (IQR)]	7 (3–10)	6 (–8)		0.70‡
Apgar 5' [Median (IQR)]	8 (6–10)	8 (6–9)		0.46‡
Early sepsis	42 (91)	6 / 6		>0.99†
Late-onset sepsis	35 (97)	5 / 5		>0.99†
NEC	21 (26)	10 / 14 (71)		**0.001†**
Jaundice	29 (28)	2 / 15 (13)		0.35†
Brain US [n(%)]				
I degree of IVH	14 (17.3)	0		**0.03†**
II degree of IVH	34 (42)	3 (25)		
III degree of IVH	14 (17.3)	4 (33.3)		
IV degree of IVH	1 (1.2)	2 (16.7)		
V degree (leukomalacia)	18 (22.2)	3 (25)		
Cognitive development	**Delayed**	**Average**		
Birth weight (grams) [Median (IQR)]	1,070 (770–1,234)	1,230 (1,001–1,491)		**0.004‡**
Apgar 1' [Median (IQR)]	7 (5–10)	9 (5–10)		0.21‡
Apgar 5' [Median (IQR)]	8 (7–10)	9 (7–10)		0.80‡
Early sepsis	9 / 9	27 (87)		0.56†
Late-onset sepsis	14 / 14	21 (96)		>0.99†
NEC	11 (50)	12 (20)		**0.008†**
Jaundice	4 (16)	24 (39)		**0.04†**
Brain US [n(%)]				
I degree of IVH	3 (13.6)	9 (16.1)		**0.008†**
II degree of IVH	5 (22.7)	26 (46.4)		
III degree of IVH	2 (9.1)	12 (21.4)		
V degree (leukomalacia)	12 (54.5)	9 (16.1)		

Apgar 1', 5' – Apgar score at 1 minute and 5 minutes, NEC – necrotizing enterocolitis, US – ultrasound, g – grams, n – number, IQR – interquartile range *Chi-square test; †Fisher's exact test; ‡Mann-Whitney U test; §Kruskal-Wallis test

Table 6. Retinopathy, bronchopulmonary dysplasia, occurrence of bronchitis, visual impairments and gastrointestinal diseases in preterm infants with birth weight below 1,500 g in relation to perinatal risk factors

ROP	**No**	**Yes**	***P***
Birth weight (grams) [Median (IQR)]	1,229 (875–1,443)	1,099 (803–1,270)	**0.02‡**
Apgar 1' [Median (IQR)]	8 (4–10)	7 (5–10)	0.65‡
Apgar 5' [Median (IQR)]	9 (7–10)	9 (7–10)	0.80‡
Mechanical ventilation [n(%)]			
invasive	22 (44)	29 (66)	**0.03**†
non-invasive	41 (82)	44 (100)	**0.003**†
Early sepsis	19 (86)	19 (95)	0.61†
Late-onset sepsis	16 (94)	23 (100)	0.43†
NEC	14 (29)	16 (39)	0.33*
BPD	**No**	**Yes**	
Birth weight (grams) [Median (IQR)]	490	846 (64–1,029)	-
Apgar 1' [Median (IQR)]	6	6 (3–10)	-
Apgar 5' [Median (IQR)]	8	8 (7–10)	-
Mechanical ventilation [n(%)]			
invasive	0	17 (81)	0.23†
non-invasive	0	21 (100)	0.05†
Early sepsis	1 / 1	6 / 6	-
Late-onset sepsis	0	14 / 14	-
NEC	0	11 / 18 (61)	-
Bronchitis	**No**	**Yes**	
Birth weight (grams) [Median (IQR)]	1,058 (720–1,375)	1,098 (848–1,247)	0.98‡
Apgar 1' [Median (IQR)]	6 (3–9)	9 (6–10)	**0.03**‡
Apgar 5' [Median (IQR)]	8 (6–10)	9 (7–10)	0.07‡
Mechanical ventilation [n(%)]			
invasive	0	17 (81)	0.23†
non-invasive	0	21 (100)	0.05†
Early sepsis	1 / 1	6 / 6	**-**
Late-onset sepsis	0	14 / 14	-
NEC	0	11 / 18 (61)	-
Feeding difficulty	**No**	**Yes**	
Birth weight (grams) [Median (IQR)]	1,084 (780–1,356)	716 (602–1,171)	0.09‡
Apgar 1' [Median (IQR)]	6 (3–9)	7 (5–10)	0.55‡
Apgar 5' [Median (IQR)]	8 (6–10)	8 (8–10)	0.48‡
Mechanical ventilation [n(%)]			
invasive	48 (42)	6 / 6	**0.007†**
non-invasive	82 (72)	6 / 6	0.19†
Early sepsis	46 (92)	2 / 2	>0.99†
Late-onset sepsis	34 (97)	6 / 6	>0.99†
NEC	28 (31)	3 / 6	0.38†

GI diseases	**Celiac disease**	**Hernia**	**Anomalies**	
Birth weight (grams) [Median (IQR)]	1,262 (895–1,497)	1,075 (745–1,281)	834 (596–1,379)	0.33§
Apgar 1' [Median (IQR)]	9 (5–10)	8 (–9)	7 (4–10)	0.55§
Apgar 5' [Median (IQR)]	9 (8–10)	9 (6–9)	8 (6–10)	0.67§
Mechanical ventilation [n(%)]				
invasive	2 / 4	4 / 6	2 / 4	>0.99†
non-invasive	4 / 6	6 / 6	2 / 4	0.13†
Early sepsis	1 / 2	0	**1 / 3**	>0.99†
Late-onset sepsis	1 / 1	3 / 3	2 / 2	-
NEC	1 / 4	4 / 6	2 / 4	0.79†

ROP – retinopathy of prematurity, Apgar 1', 5' – Apgar score at 1 minute and 5 minutes, NEC – necrotizing enterocolitis, US – ultrasound, BPD – bronchopulmonary dysplasia, GI diseases – gastrointestinal diseases, g – grams, n – number, IQR – interquartile range *Chi-square test; †Fisher's exact test; ‡Mann-Whitney U test; §Kruskal-Wallis test

Delayed cognitive development is significantly more associated with lower birth weight (P = 0.004), a higher incidence of NEC (P = 0.008), less frequent jaundice (P = 0.04) and a higher incidence of leukomalacia (P = 0.008) (Table 21). ROP is more frequent in preterm infants with lower birth weight (P = 0.02), and in those who underwent either invasive (P = 0.03) or non-invasive (P = 0.003) mechanical ventilation. Feeding difficulties are significantly more present in preterm infants who were on invasive mechanical ventilation (P = 0.003) (Tables 5 and 6).

Discussion

During the observed period, 3,754 children were born, of which 120 were born with a birth weight of less than 1,500 g and a gestational age of less than 37 weeks. Their incidence rate is 3.19%, which is lower than the global prevalence, ranging between 5 to 7% (7, 8). The lower value in this study is attributed to better prenatal care, consistent with the average preterm birth rate in Croatia (9). A total of 30 infants died before reaching the age of three, with the final number of 90 (55.55% boys and 44.45% girls). The data that boys are more likely to be born prematurely are supported by numerous other studies (7, 10). In our study, the median maternal age was 31 years.

Mothers' diseases did not show statistically significant differences in children with normal or pathological neurodevelopmental outcomes but certainly influenced preterm birth, especially autoimmune diseases that were found in 34% of mothers. This is also confirmed by other studies (11). Infections during pregnancy were reported in 37 mothers.

Early perinatal characteristics were explored. The AS at the first minute had a median of 6 with a range from 0 to 10, and at the fifth minute, the median was 8 with a range from 1 to 10. AS values at 5 and 10 minutes did not prove statistically significant in our research, indicating that a combination of multiple risk factors is needed to assess the outcome.

All children spent a certain period in the incubator. The median number of days in the incubator was 24. More than one-third of preterm infants, 36.7% of participants, developed ROP, which is in line with the global prevalence of ROP in VLBW children but lower than the expected prevalence of ROP in Croatia, which is 56.5% (12). The most affected zone was Zone II, correlating with a 2016 study where 56.5% of involvement was in Zone II. Statistically significant risk factors for ROP development were low birth weight and the frequency of invasive and non-invasive ventilation. Additionally, infants on invasive ventilation more often developed feeding difficulties.

NEC occurred in 25.8% of preterm infants, most commonly at Stage 1A. A meta-analysis from 2020 presented data showing that NEC in VLBW infants occurs in the range of 2 to 13%, significantly lower than in our study (13).

A statistically significant finding is IVH, which occurs twice as often in our study than in others (4, 14). IVH increases the risk of permanent psychomotor deviation and reduces the survival of newborns. The pathogenesis of IVH is influenced by low AS, hypoxia, hypercapnia, infections, RDS and many others. The most common finding is Grade II IVH, which is associated with milder neurodevelopmental deviations, and PVL as the most severe degree associated with CP. Forty-five to 85% of VLBW infants with a high grade of IVH develop severe cognitive deficits, and 75% of them require specialized forms of education (15).

Despite the development of neonatal care, sepsis remains a common cause of neonatal morbidity and mortality (16). Our study showed that a statistically significant number of respondents had overcome sepsis, with early-onset sepsis occurring at a higher ratio than late-onset sepsis.

The mortality rate was 25% among newborns, with a median weight of 613 g, AS of 3 at the first minute and 5 at the fifth minute. The median number of days until death was 3 days, indicating progressive deterioration in these patients. Many of them received corticosteroids, surfactants and invasive mechanical ventilation.

Additionally, a statistically significant proportion of children had mothers with infections or autoimmune disorders. In comparison to survivors, they were more likely to be preterm, have lower birth weights, higher degrees of IVH, and received less surfactant or were less on non-invasive mechanical ventilation.

CP incidence was 4.2%, which is similar to A. Pascal's study that was conducted from 2006 to 2018, with a prevalence of 6.5%.

The development of motor, cognitive and speech functions directly correlates with the degree of IVH. Children with the highest degree of IVH achieved the weakest results in motor development. Slower motor development was associated with lower birth weight, lower AS at the first minute and the presence of NEC. Slower speech development was significantly associated with lower birth weight and the presence of NEC. Cognitive development was most influenced by the occurrence of NEC, a higher frequency of leukomalacia, lower birth weight and a lower frequency of jaundice. Seizures were significantly more common in preterm infants with NEC and a higher degree of cerebral hemorrhage.

Regarding the association between maternal diseases during pregnancy and neurodevelopmental outcomes, there were no statistically significant differences. However, preterm infants born by mothers with infections during pregnancy more frequently developed delayed motor and speech development. Similarly, preterm infants whose mothers took more than 2 prescribed drugs during pregnancy more often exhibited delayed motor development, while preterm infants whose mothers took antibiotics during pregnancy more frequently experienced delayed speech development.

Conclusion

Based on the conducted research and collected data, the following conclusions are drawn:

1. The incidence of preterm births with LBW below 1,500 g is 3.19%, which is within the lower European range.

2. The development of motor, cognitive and speech functions is directly related to the degree of IVH. Children with the highest degree of IVH achieve the weakest results. Slower motor development significantly more often occurs in children with a birth weight below 1,000 g, lower AS in the first minute and the presence of NEC. Cognitive development is significantly influenced by lower birth weight, higher degree of IVH with the occurrence of convulsive seizures, the presence of PVL and NEC.

3. The mortality rate occurs in 1/4 of VLBW preterm infants, and it is most common in infants with extremely short gestation below 25 weeks, and birth weight below 800 g, with pregnancy infections and maternal autoimmune diseases being significant risk factors for mortality.

4. Neurodevelopmental outcomes of VLBW preterm infants depend on a combination of various risk factors, including maternal diseases before pregnancy, complications during pregnancy, as well as different comorbidities and complications that occur sooner or later in the development of preterm infants with birth weight less than 1,500 g.

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Neurorazvojni ishodi nedonoščadi vrlo male rodne mase u regionalnoj pedijatrijskoj klinici

Cilj: Ispitati učestalost i etiologiju neuroloških ishoda u nedonoščadi s vrlo niskom porođajnom težinom, čimbenike rizika kod majke i tijekom perinatalnog perioda, komorbiditete i kliničku sliku i usporediti s novorođenčadi iste gestacijske dobi koja nisu razvila neurološki poremećaj.

Metode: Istraživanje je provedeno na Klinici za pedijatriju KBC-a Osijek. U istraživanje su uključena sva novorođenčad rođena u razdoblju od 1. 1. 2018. do 31. 12. 2019. godine s porođajnom težinom manjom od 1 500 g i gestacijskom dobi kraćom od 37 tjedana. Podaci su prikupljeni pregledom medicinske dokumentacije i bolničkoga informatičkog sustava.

Rezultati: U promatranom razdoblju rođeno je 120 djece s porođajnom težinom manjom od 1 500 g i gestacijskom dobi kraćom od 37 tjedana. Čimbenici rizika za prijevremeni porod kod majki i tijekom perinatalnog perioda uključuju autoimune bolesti majke, infekcije tijekom trudnoće i komplikacije pri porodu. Rane komplikacije koje prate odabranu skupinu su RDS, ROP, NEC, IVH, sepsa, kongenitalne srčane mane i poremećaj metabolizma glukoze. Usporeni motorički, kognitivni i govorni razvoj najviše su pod utjecajem male porođajne težine, višeg stupnja IVH-a, nižeg apgar indeksa u prvoj minuti i prisutnosti NEC-a. Značajni čimbenici rizika za smrt su gestacijska dob manja od 25 tjedana, porođajna težina manja od 800 g, infekcije u trudnoći i autoimune bolesti majke.

Zaključak: Neurološki ishod nedonoščadi s vrlo malom porođajnom težinom ovisi o kombinaciji komorbiditeta, majčinskih, perinatalnih i neonatalnih čimbenika rizika.