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PREMATURE NEWBORNS WITH VERY-LOW BIRTH WEIGHT - MEDICAL AND SOCIAL ISSUES

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ABSTRACT

The newborns with very-low birth weight (VLBW) present a high-risk group in terms of morbidity and mortality. In 1996-2000, a total of 264 newborns with birth weight below 1500g were treated in the Neonatology Intensive Care Unit of the Clinic of Neonatology, Department of Obstetrics and Gynaecology, Medical University of Varna and in the Clinic of Obstetrics, Specialized Hospital of Obstetrics and Gynaecology of Varna. Respiratory distress syndrome and infectious pathology were the leading causes for VLBW morbidity. The most widespread infectious agents were *Enterococcus*, *E. coli*, *Pseudomonas*, and *Enterobacteriae*. The mortality rate was highest within the first 24 hours. Most commonly, the respiratory distress syndrome, maternal-fetal infections caused by Gram-negative flora and perinatal asphyxia caused death. The intensive treatment included mechanical ventilation, oxygen therapy, surfactants, parenteral nutrition, bioproducts, and antibiotics. Modern methods for noninvasive monitoring of blood gases and saturation, follow-up by ophthalmopediatricians, neurologists and psychologists, ultrasound and CT diagnosis of the central nervous system could decrease of the complications and damages of prematurity.

Key words: very-low birth weight newborns, morbidity, mortality, intensive therapy, complications

During the recent years there is a tendency of a steadily increasing incidence rate of premature births. The newborns with very-low birth weight (VLBW) present a high-risk group in terms of morbidity and mortality during the neonatal period. They require long intensive treatment and care to improve their survival rate and alleviation the severe complications leading to a possible handicap. The advances of neonatology and the introduction of the most up-to-dated methods of treatment make the successful upbringing of these newborns possible.

The aim of the study was to present the most common diseases and complications, the causes for death as well as the type and volume of the intensive therapy administered in VLBW newborns.

MATERIAL AND METHODS

The retrospective analysis included 264 newborns with body weight below 1500g who were treated in Neonatology Intensive Care Unit (NICU) of the Clinic of Neonatology, Department of Obstetrics and Gynaecology, Medical University of Varna and in the Clinic of Obstetrics, Specialized Hospital of Obstetrics and Gynaecology of Varna in 1996-2000. The total number of the newborns during this period was 10237, of whom 1336 were underweight at delivery (13%). The group of the VLBW newborns comprised 19,7% of the total number of the premature newborns and 2,57% of all the newborns.

The gestation age was determined to the date of last regular menstruation, ultrasound investigations of the pregnant women and morphological criteria after birth (Hopfner-Rautenbach). Some 210 newborns were AGA and 54 newborns were SGA. The newborns were assessed as SGA if their had body weight was below the 10th percentile (Table 1).

Table 1. Distribution of newborns according to their body weight at birth

Weight (g)	n	%
500-599	2	0,76
600-699	8	3,03
700-799	12	4,55
800-899	29	10,98
900-999	89	33,71
1000-1500	124	46,97
total	264	100,00
gestational age	27-31 ±0,5 g. w.	

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The birth of VLBW newborns was, most commonly, a consequence of a pathological pregnancy with bleeding, fetal disease, maternal infection, or multiple pregnancy. Forty-nine newborns (18,28% of the cases) were delivered from a multiple pregnancy (two or three fetuses).

RESULTS AND DISCUSSION

Respiratory distress syndrome (RDS) and infectious pathology were the leading causes for VLBW morbidity. The early infections were almost always maternal-fetal (anamnestic data of prematurely opened amnial sack, infectious diseases of the mother prior to delivery - fever, leukocytosis, positive results from vaginal secretion and uterine cavity). They were often related to the immediate reason for the premature delivery (2,6,7).

The late infections (after 7th day) resulted from the immaturity of the immune system in these newborns, the great number of invasive diagnostic and treatment manipulations, and nosocomial infections. The most widespread etiological agents included *Enterococcus*, *E. coli*, *Pseudomonas*, *Enterobacteriae*, and more rarely - *Klebsiella*.

A high incidence was observed in the newborns with perinatal asphyxia, born with a low Apgar score in whom, subsequently, cerebral lesions such as periventricular malacia and intraventricular haemorrhage (IVH) could be diagnosed (2,5,7).

Retinopathy is a severe complication in VLBW newborns. These newborns and the newborns at low gestation age much more commonly develop severe RDS, congestive heart failure and the related complications requiring prolonged mechanical ventilation (MV) and oxygen therapy (1). In these newborns there are much more frequent accidents of hypoxia (antenatal and postnatal), hypercarbia, anemia, persistant arterial duct and pathological pH changes (Table 2 and Table 3).

Table 2. Morbidity in very-low birth-weight newborns

Disease/Weight	Below 1000 g	1000-1500 g	Total	
	n	n	n	%
hyaline membrane disease	56	57	113	42,80
mother-fetal infection	40	55	95	35,9
sepsis	5	15	20	7,6
pneumonia	8	5	13	4,9
hemolytic disease	11	8	19	7,2
congenital anomalies	4	7	11	4,17
asphyxia	53	39	92	34,8
intraventricular haemorrhage	33	9	42	15,9
Total	140	124	264	100

Table 3. Complications in very-low birth-weight newborns

Complications/Weight	Below 1000 g	1000-1500 g	Total	
	n	n	n	%
pneumothorax	2	2	4	0,37
persistant arterial duct	11	2	13	4,9
anemia	33	79	112	42
Total	140	124	264	
Late complications (after day 28)	54	92	146	
ROP	27	31	58	39,7
IVH	14	4	18	12,3
BPD	7	3	10	6,85

The mortality rate in the VLBW newborns in the early neonatal period was high and determined by their immaturity and severe accompanying pathology. The total neonatal mortality rate compared with all live births with body weight below 1500g (for the newborns below 1000g concerning these survived after day 6, respectively) was of 24,86%, e. g. 47 out of 189 newborns (Table 4).

Table 4. Mortality in very-low birth-weight newborns

Time of exitus	IV gr		III gr		Total	
	n	%	n	%	n	%
until 24th hour	41	46	6	18,2	47	38,5
until 6th day	34	38,2	11	33,3	45	36,9
after day 6	11	12,4	15	45,44	26	21,3
after day 28	3	3,4	1	3,03	4	3,3
Total	89	100	33	100	122	100

The highest mortality rate was reported within the first 24 hours, especially in the newborns with body weight below 1000g. The most common diseases that lead to death in the first days after birth include RDS, maternal-fetal infections caused by Gram-negative flora and perinatal asphyxia whereas the late neonatal mortality occurred as a consequence of the infections (often nosocomial) caused by Gram-negative flora (Table 5).

The administered intensive treatment corresponded to the most common pathology in this group of newborns (Table 6). It included mechanical ventilation, oxygen therapy, surfactant therapy, parenteral nutrition, transfusion of bioproducts, and antibiotic therapy. The clinical and bio-

chemical data about respiratory failure immediately after birth in VLBW newborns determined the need for oxygen therapy for a period of different duration in any the newborns in this group.

Table 5. Causes for death in very-low birth-weight newborns

Cause for death/Weight	Below 1000g	1000-1500g	Total	
	n	n	n	%
RDS	45	12	57	46,72
infections	18	12	30	24,6
IVH	19	5	24	19,68
Other (asphyxia, DIC)	7	4	11	9,0
Total	89	23	122	100

Table 6. Intensive therapy in very-low birth-weight newborns

Procedures	Below 1000g	1000-1500g	Total	
	n	n	n	%
IVH	57	64	121	45,83
until 3rd hour	31	32	63	
until 24th hour	10	19	29	
after 24 hours	16	13	29	
Oxygen therapy	140	119	259	98,10
surfactant	16	20	36	13,63
blood transfusions	mean of 1,54 (1-3)	mean of 1,8 (1-4)		
total parenteral nutrition	mean of 12 days	mean of 8 days		

Table 7. Parameters in newborns on prolonged MV after 28 days

Duration of mechanical ventilation (hours)	138,6 (72-456)
Pin on 24th hour	16 ±2
Pin on 72nd hour	16 ±1,5
Duration of oxygen therapy (hours)	517 (283-1341)
FiO_2 on 24th hour	0,85 ±0,12
FiO_2 on 72nd hour	0,60 ±0,15

Table 8. Outcome after MV

Outcome	Total	
	n	%
survived	53	43,90
deceased until day 6	41	33,88
deceased after day 6	23	19
deceased after day 28	4	3,32
Total	121	100,00

The results from the application of the MV and oxygen therapy were summarized on Table 7.

Table 9. Complications after MV

Complication	Total	
	n	%
pneumothorax	4	9,5
ROP gr. I-II	17	44
ROP gr. III-IV	5	11,9
IVH gr. III-IV	8	19
BPD O_2 after day 28	6	14
BPD O_2 after 36 g. w.	2	9,5
Total	42	100,00

The MV was applied in 121 newborns (45,83%). These newborns needed prolonged MV not only because of respiratory diseases (hyaline membrane disease and apnea), but also because of severe immaturity and central neurological disorders resulting from perinatal asphyxia (IVH) (2,6). The surfactant means Exosurf and Curosurf were applied in 36 newborns (in 13,63% of the cases) according to approved protocols. They diminished the time for MV and oxygen therapy and thus enabled the reduction of the supplied oxygen concentrations and, therefore, the reduction of the incidence of the bronchopulmonary dysplasia (BPD), air-leak syndrome, and retinopathy of prematurity (ROP) (4,5,6). The newborns who had timely undergone MV showed a lower incidence rate of IVH and ROP while these who were affected by the disease presented, more commonly, with a mild degree and favourable evolution of the disease.

The low morphological maturity, the lack of sucking and swallowing reflex, the reduced nutritional tolerance as well as the severe physical status of the newborns required a total parenteral nutrition for a various period of time in all the

newborns below 1000g. The mean duration of this nutrition was of 8,5-12 days.

The high incidence of maternal-fetal infection that was, most frequently, the direct reason for the delivery of a VLBW newborn required antibiotic therapy in over 90% of the cases.

In 18 of them an immunoprophylaxis with Immunovenin was applied on the occasion of a severe neonatal infection.

The outcome and the complications in the VLBW newborns were demonstrated on Table 8 and Table 9.

CONCLUSIONS

The high neonatal morbidity and mortality rates in VLBW and the prolonged and expensive intensive therapy requires that the struggle with prematurity is a fundamental care and a priority in modern perinatal medicine.

The application of adequate intensive treatment with a good primary intensive care, prolonged respiratory reanimation and surfactant therapy offers a good possibility for survival improvement rate in newborns with VLBW and at low gestational age.

It is necessary to use modern methods for control such as noninvasive monitoring of blood gases and saturation, neurological and psychological monitoring, follow-up by ophthalmologists-pediatricians, ultrasound and CT diagnosis of the central nervous system. They will reduce the complications and permanent damages leading to severe disability in this high-risk group of newborns. Prevention of nosocomial infections in the NICU is an additional opportunity to reduce the mortality rate of this contingent.

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