Low birth weight newborns

Low birth weight neonates (LBW) are children with a birth weight of less than 2500 g (regardless of etiology and length of pregnancy). Their incidence is still slowly rising, e.g. in 2009, LBW accounted for 7.8% of all live births. This tendency is due to an increase in the number of multiple pregnancies, a shift in the age of mothers giving birth (the incidence of obstetric pathologies increases as the mother ages) and the influence of socio-economic factors (neglected prenatal care). LBWs account for 66-70% of neonatal mortality.[1]

LBW classification according to birth weight (BW):

- BW below **2500 g** – newborns with low birth weight (*low birth weight*, *LBW*),
- BW below **1500 g** – newborns with very low birth weight (*very low birth weight*, *VLBW*),
- BW below **1000 g** – newborns with extremely low birth weight (*extremely low birth weight, ELBW*).

Classification of LBW according to etiology:

- Eutrophic prematurity - born at 36 weeks or earlier, birth weight is appropriate for the length of pregnancy.
- Prematurity/hypotrophic term – weight is below the 5th percentile of weight for the given completed week of gestational age *(small for gestational age, SGA).*[2]

Etiopathogenesis

The main causes of low birth weight are premature birth (chorioamnial infection, multiple pregnancy), intrauterine growth retardation (IUGR) or their combination.

- **Prematurity Risk Factors:**
  - From the mother's side - hemolytic disease of the newborn, incompetence of the cervix, preeclampsia, serious systemic diseases, urinary tract infections.
  - Placental - premature separation, amnionitis, polyhydramnios, premature rupture of membranes (PROM).
  - From the side of the fetus – multiple pregnancy, congenital developmental defects.[1]

- **Growth retardation risk factors:**
  - From the mother's side - malnutrition, chronic diseases, gestosis, hypertension, toxic substances (alcohol, nicotine, drugs, antimitotics).
  - Placental - separation of the placenta, placentitis, heart attacks, feto-fetal transfusion syndrome.
  - From the side of the fetus – multiple pregnancy, chromosomal anomalies, chronic fetopathy.[1]

- **The most common direct causes of LBW births:**
  - disorders of placentation and placental function (small placenta, placenta previa, premature degenerative changes, abruption),
  - intrauterine infection,
  - immunology – HELLP syndrome, preeclampsia,
  - incompetence of the cervix,
  - abnormalities of the uterus (postoperative conditions, congenital developmental defects of the uterus, fibroids).

- **The most common indirect causes of LBW births:**
  - heavy obstetric anamnesis (treated sterility, repeated abortions, previous premature births, multiparity),
  - low socio-economic status,
  - risky behavior during pregnancy (lifestyle disorders, stress, smoking, alcohol and drug abuse, malnutrition),
  - external environment,
  - physical characteristics of the pregnant woman (malnutrition, eating disorders)
  - the age of the pregnant woman (low or, conversely, higher age).

Organization of care for LBW

- Care must be differentiated according to the degree of immaturity and severity of the clinical condition (three-level care):
  - **I. level: basic** (basal) **care** in wards for physiological newborns,
    - slightly premature and hypotrophic newborns without more serious disorders,
    - increased care for body temperature, nutrition and protection against infection.
  - **II. level: intermediate care** provided by intermediate perinatal care workplaces, of which there are 6 in the Czech Republic,
    - LBW with a BW above 1500 g and a gestational age of 32–35 weeks.
  - **III. level: intensive resuscitation care** provided by

Newborn baby in incubator.

perinatological centers, of which there are 12 in the Czech Republic,
    - care of extremely and very immature newborns (24-32 weeks of pregnancy, PH below 1500 g), perinatally acquired, severe infections (especially sepsis), perinatal asphyxia and related conditions, long-term ventilation, care of newborns with intrauterine growth retardation and last but not least, the care of newborns with congenital malformation, compatible with life, but requiring a surgical solution and subsequent highly specialized care.
- **Center for extracorporeal membrane oxygenation of newborns** (ECMO center) – 1 center in the Czech Republic at the Perinatology Center III. type.
    - care of critically ill newborns with cardiorespiratory failure (pulmonary hypertension due to meconium aspiration, adnate pneumonia, diaphragmatic hernias, RDS and respiratory failure unsolvable by ventilation therapy).[3]

Premature newborn

Definition: a newborn born before the completed 37th week of pregnancy[2]

Complications of immaturity

- postpartum adaptation disorders,
- immaturity of the lungs – respiratory distress syndrome (RDS), bronchopulmonary dysplasia (BPD, CLD),
- circulatory instability (hypotension, organ hypoperfusion), persistent Botall's duct, intracranial bleeding,
- immaturity of the gastrointestinal tract – slower passage and lower digestive capacity, risk of developing necrotizing enterocolitis,
- immaturity of the kidneys (tubules and glomeruli) – higher losses of water and salts, but also the inability to exclude excessive water and salt load,
- relatively large body surface and a minimal layer of subcutaneous fat, high skin
- permeability – risk of hypothermia/hyperthermia, significant fluid loss through perspiration (the more immature the newborn, the higher the temperature and humidity of the environment required),
- increased risk of hypoglycemia, hypocalcemia, hyperbilirubinemia,
- immature immune system – higher risk of infections,
- immature retina - risk of retinopathy of prematurity.[2]

Prenatal care

Premature birth should be conducted in a workplace that is adequately equipped to care for premature newborns. At the onset of preterm labor, tocolysis is performed to allow time for fetal lung maturation by administering corticoids to the mother. Antibiotic therapy of the mother is indicated if infection is suspected. The birth must be conducted carefully due to the greater vulnerability of the fetus.[2]

Postpartum care

- maintaining body temperature, preventing heat loss – ensuring a thermoneutral environment in the incubator or heated bed,
- monitoring postpartum adaptation and further development,
- gentle handling (treatment, positioning),
- adequate respiratory support and oxygen therapy, administration of exogenous surfactant as needed,
- blood circulation support,
- parenteral nutrition,
- gradual introduction of enteral nutrition according to the state and degree of immaturity.[2]

Causes of increased morbidity of premature babies after discharge to field care

- breathing problems – respiratory infection (RSV), apnoeic pauses, asthma,
- heart and blood circulation – persistent ductus arteriosus,
- GIT and abdomen – gastroesophageal reflux, constipation, inguinal hernias, umbilical hernias, testicular retention,
- urinary system – consequences of aminoglycoside toxicity, consequences of hypoxia, ischemia,
- eyesight - consequences of retinopathy, refractive errors, strabismus, astigmatism, amblyopia, central vision disorder,
- hearing – conduction or central hearing disorders,
- CNS – cerebral palsy, disorders of mental development, ADHD,
- blood - anemia of prematurity,
- bones – metabolic bone disease due to immaturity (osteopenia of prematurity),
- overall development – failure to thrive, hypotrophy, growth disorders.[4]

Hypotrophic newborn

Definition: a newborn with a birth weight below the 5th[2], 10th[5] percentile for the given gestational week and sex.

Intrauterine growth retardation first affects weight, then length and finally head circumference. In the case of growth retardation in the late phase of pregnancy, the so-called **asymmetric type** is involved, newborns are "long and thin", in the case of growth retardation starting before the 28th week of pregnancy, the so-called **symmetric type** is described, where the fetus is proportionally small in all three components.[2]

Complications of hypotrophy

- subcutaneous fat is poorly formed or absent - thermostability,
- metabolic complications (hypoglycemia, hypocalcemia, hypomagnesemia),
- hematological complications (polycythemia),
- manifestations of congenital infection (organ changes, etc.),
- long-term – brain damage from chronic hypoxia (delayed psychomotor development),
- lowed growth (sometimes with the necessity of growth hormone treatment).[2]

LBW nutrition after discharge to home care

The growth of LBW early after birth tends to be negatively affected for various reasons, and these children usually have a lower weight and length at birth than full-term newborns. This phenomenon is called EUGR — *extrauterine growth restriction*. The highest risk group is LBW and ELBW. The goal of nutrition is to normalize growth and optimize body composition. These children often have extremely high nutritional and mineral needs. Protein-energy and mineral deficit has a negative effect on psychomotor development.[6]

Newborns with adequate growth and early postnatal catch-up (growth spurt) usually do not require special nutritional intervention. A slightly higher risk group are newborns with IUGR without early postnatal catch-up. The most at-risk group are newborns born as eutrophic, but with postnatally formed EUGR. This group almost always requires nutritional intervention.[6]

Breast feeding

Breastfeeding or feeding with expressed breast milk is the ideal form of nutrition. In LBW, rigorous monitoring of growth parameters (weight, length, head circumference) and mineral and bone metabolism is necessary. Newborns with EUGR often require fortification of breast milk or a combination of breastfeeding with post-discharge formula, mineral supplementation, etc.

Formula for premature babies

LBW who cannot be breastfed are recommended to be fed with preterm formulas until they complete 40 weeks of gestation or reach a weight of 3500g.[6]

Initial formula

LBW with adequate growth, early postnatal catch-up and IUGR who cannot be breastfed can be fed initial formula from about 38 weeks of gestation.[6]

Post-discharge formula

Post-discharge formulas are intended for newborns with EUGR, or IUGR who cannot be breastfed or do not receive a sufficient volume of breast milk. The optimal duration of administration of these formulas is not known.[6]

Introduction of complementary foods

For babies born after the 35th week of pregnancy, solid foods are introduced in the same way as for full-term babies. For children born before the 35th week of pregnancy, solid foods can be introduced 5-8 months from the date of birth, no earlier than after the end of the 3rd month (13th week) of the corrected age of the child. The introduction of complementary foods is assessed individually according to the state of health, psychomotor maturity and development.[6]

Main causes of death of ELBW

1. infection (often nosocomial),
2. hypoxic bleeding,
3. acute respiratory failure.

Sources

Related articles

- Characteristics of the newborn period • Hypotrophic newborn • Immature newborn • Treatment of premature infants

External links

- Česká neonatologická společnost (http://www.neonatologie.cz/)
- Sekce perinatální medicíny ČGPS (http://www.perinatologie.cz/)

References

1. BENEŠ, Jiří. *Studijní materiály* [online]. ©2007. [cit. 2009]. <http://www.jirben.wz.cz/>.
2. DORT, Jiří, et al. *Neonatologie : vybrané kapitoly pro studenty LF.* 1. edition. Karolinum, 2005. ISBN 80-246-0790-5.
3. Sekce perinatální medicíny ČGPS. *Koncepce perinatologického programu* [online]. [cit. 2013-03-14]. <http://www.perinatologie.cz/koncepce.php>.
4. PEYCHL, Ivan. *Nedonošené dítě v péči praktického a nemocničního pediatra.* 1. edition. Galén, 2005. pp. 34. ISBN 80-7262-283-8.
5. GOMELLA, TL, et al. *Neonatology : Management, Procedures, On-Call Problems, Diseases, and Drugs.* 6. edition. Lange, 2009. pp. 558. ISBN 978-0-07-154431-3.
6. Pracovní skupina dětské gastroenterologie a výživy. Doporučení pracovní skupiny gastroenterologie a výživy ČPS pro výživu kojenců a batolat. *Česko-slovenská pediatrie.* 2014, y. -, vol. duben, p. 18-21, ISSN 0069-2328.