Prematurity and Low Birth Weight

What is prematurity and low birth weight?
Infants born prior to 37 weeks gestation are considered premature. Babies born less than 2500 grams (5.5lbs) are considered low birth weight (LBW) irrespective of their gestational age. Generally, when an infant is less than 1500 grams (3.3 lbs), they are considered very low birth weight and less than 1000 grams (1.5 lbs) extremely low birth weight. Prematurity and low birth weight are most often co-occurring conditions, however some babies with low birth weight are born at full term. About 67% of low birth weight babies are born prematurely.

<table>
<thead>
<tr>
<th>Weeks Gestation</th>
<th>Weight (in grams and approximate pound equivalent)</th>
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<tr>
<td>37</td>
<td>2500 g. (5.5 lb) Low birth weight</td>
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<tr>
<td>32</td>
<td>1500 g. (3 lb) Very low birth weight</td>
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<tr>
<td>30</td>
<td>1250 g. (2.5 lb)</td>
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<tr>
<td>28</td>
<td>1000 g. (2.25 lb) Extremely low birth weight</td>
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<tr>
<td>24</td>
<td>500 g (1 lb)</td>
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What is the incidence of prematurity and low birth weight?
More than 540,000 children or over 12.8% of infants were born prematurely in the United States in 2006. This percentage represents a 20% increase since 1990 and the rate continues to climb. These numbers also coincide with the increase in infant mortality rates; over one third of all infant deaths are related to premature birth. African-American infants have the highest rate of premature birth (18.5%) and are three times as likely to be born extremely premature as non-Hispanic white and Hispanic infants. This is also the case in Alaska and the District of Columbia where the percentage of African-American infants born prematurely is higher than for other infants; 13.6% and 19% respectively.

Infants born weighing less than 2500 grams or 5.5 pounds totaled over 330,000 of the over 4 million births (over 8%). More than one percent of infants were very low birth weight or less than 1.5 pounds. In the U.S., African American infants also have the highest rate of low (11%) and very low (2.7%) birth weights compared to the general population rates (6% and 1% respectively). The low birth weight rate is even higher for African American infants (14%) in the District of Columbia. The lower the birth weight, the higher the risk of disability and death in infants. Nearly 25% of all infants born very low or extremely low birth weight died during the first year of life compared to less than one percent of normal weight newborns.
What are causes of prematurity and low birth weight?
In many cases, there is no identifiable reason for preterm birth and low birth weight, but some factors are known risks for premature birth

- History of prior preterm birth
- Carrying more than one baby
- Cervical or uterine abnormalities
- Infection
- Diabetes
- Hypertension
- Late or no prenatal care
- Smoking
- Alcohol and illicit drug use
- Pre-eclampsia
- Other maternal health problems

What can be done to prevent prematurity and low birth weight?
Not all premature births can be prevented but there are some things that can reduce the risk.

- Cessation of smoking
- Early and consistent prenatal care
- Proper maternal nutrition
- Control of diseases such as diabetes and high blood pressure
- Early and immediate health care when there are concerns about a pregnancy

What are the medical and developmental complications of prematurity and low birth weight? The medical and developmental complications for infants born prematurely and with low birth weight vary widely. Many factors influence the complications and they are dependent on the health of the mother, the vulnerability and resilience of the individual infant and the degree of prematurity and low birth weight.

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- Patent Ductus Arteriosus (PDA)
- Necrotizing Enterocolitis (NEC)
- Post natal growth problems
- Infection
- Higher risk for infant death

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Neuropathological Conditions

*Intraventricular hemorrhage (IVH).* A neurological complication when bleeding occurs in the brain. The more premature the infant, the higher the incidence of IVH. Infants born before 32 weeks of pregnancy are at the highest risk. The bleeds usually occur in the first three days of life and generally are diagnosed with an ultrasound examination. Most brain bleeds are mild and resolve themselves with no or few lasting problems. More severe bleeds can cause the ventricles in the brain to expand rapidly, causing pressure on the brain that can lead to brain damage. The severity of the IVH is described in grades I, II, III and IV with grade VI being the most severe. Infants with IVH are at risk for complications like cerebral palsy and intellectual disabilities and the risk increases with the grade of the IVH.

*Periventricular leukomelacia (PVL).* PVL occurs when there is damage resulting in death of cells and tissue in the area around the ventricles of the brain. This area of the brain is vulnerable to damage by variations in blood pressure and oxygenation often experienced by complications of premature birth. It can occur with IVH and is also diagnosed by cranial ultrasounds over time or by magnetic resonance imaging (MRI). Infants with PVL are at very high risk for cerebral palsy, visual impairment, intellectual disability, and seizures.

*Seizures.* These are brief and unpredictable neurologic episodes characterized by the abnormal firing of large portions of neurons in the brain causing interruption in brain function and mild to severe symptoms like staring, eye rolling, muscle tension or spasms, loss of balance, and loss of consciousness lasting seconds or minutes. The symptoms are individual and related to the area of the brain affected. Seizures in children born prematurely are often due to damage to the brain but can have other origins.

Pulmonary Conditions

*Apnea and Bradycardia.* Apnea is the interruption of breathing for 20 seconds or more. It is often accompanied by bradycardia which is a slowing of the heart rate.
**Respiratory distress syndrome (RDS)**
Most infants born less than 34 weeks experience RDS. Babies with RDS lack a protein called surfactant that keeps the small air sacs or alveoli in the lungs from collapsing and sticking together. Mothers are given medications to promote surfactant manufacture in the infants just prior to giving birth or the infants are given the surfactant after birth to reduce this problem. Babies with RDS may also need additional oxygen and mechanical ventilation. One form of mechanical ventilation is continuous positive airway pressure or CPAP which delivers pressurized air to the baby's lungs through small tubes. Other ways to improve oxygen flow include extracorporeal membrane oxygenation (ECMO) which is the process of putting oxygen directly into the blood and inhaled nitric oxide to increase oxygen levels in the blood. RDS and the use of different oxygen boosting technologies cause complications to the lung, heart, brain and eyes. The infant may also experience a chronic lung disease (see bronchopulmonary dysplasia).

**Bronchopulmonary dysplasia (BPD).** Chronic lung disease most commonly affects premature infants who require ongoing treatment with supplemental oxygen. The risk of BPD is increased in babies who still need mechanical ventilation or other oxygen increasing technology. Infants with BPD can develop fluid in the lungs, scarring and lung damage. Treatment includes medications that make breathing easier and slow weaning from the ventilator. Their lungs usually improve over the first two years of life. However, many children develop chronic lung disease resembling asthma. Infants requiring a respirator at greater than 70% oxygen for more than four days are at high risk for developing BPD. High levels of oxygen can cause damage to the trachea, bronchi, bronchioli and alveoli and thick secretions can develop.

**System Immaturity**

**Hyperbilirubinemia and Jaundice.** Premature babies are likely to have immature livers that are not able to remove a waste product called bilirubin from the blood. This results in too much of the substance and is called hyperbilirubinemia. Bilirubin at high levels causes the yellowing of the skin and eyes, called jaundice, and if at high enough levels a condition called kernicterus can cause damage to the basal ganglia area of the brain. Premature infants may be more sensitive to the ill effects of excess bilirubin. Blood tests are used to monitor the bilirubin levels and the baby is treated with ultraviolet light therapy (phototherapy) which assists the body to eliminate bilirubin. Occasionally, a baby may need a blood transfusion.

**Patent ductus arteriosus (PDA).** Infants are born with a vessel called the ductus arteriosus that diverts blood flow from the lungs until birth. This vessel typically closes after birth allowing blood flow to the lungs to begin and oxygen to reach the bloodstream. For many low birth weight and premature infants, this vessel often remains open, decreasing the ability of the lungs to get oxygen into the blood and stressing the heart. Treatment includes drugs that helps close the ductus, although surgery may be necessary if the drug does not work.

**Necrotizing enterocolitis (NEC).** Premature and low birth weight infants have immature gastrointestinal systems being prone to infection. NEC is a life threatening disease some premature babies develop in their intestines. Treatment includes withholding oral feeding, antibiotics, and intravenous nutrition. NEC can lead to feeding difficulties, abdominal swelling and other complications. NEC can be diagnosed with imaging tests, such as X-rays, and blood
tests. In some cases, parts of the intestine are very infected or develop ischemic necrosis and surgery is necessary to remove damaged sections of the intestine.

*Postnatal growth problems.* Children born prematurely and/or with low birth weight experience difficulties in growth. Most catch up to their peers in their height, weight and head circumference in the first two years of life. However, the more premature or the lower the birth weight the infant is, the higher the risk of growth problems in childhood. Some infants have severe problems with feeding and growth and have what is called *failure to thrive* where the infant’s growth is falling behind what their previously established growth rate was. Failure to thrive can be caused by many factors including gastrointestinal problems, feeding problems, airway and respiratory problems, or poor motor function.

*Anemia.* Anemia is a condition where the body does not have enough red blood cells and is common to premature infants. Infants born full term store iron during the last part of pregnancy and use this iron to make red blood cells after birth. Infants born prematurely may not have had enough time to store iron. Infants with anemia can develop feeding and growth problems as well as complicate existing heart or breathing problems. Anemia is usually short term and treatment includes iron supplements or transfusions in severe cases.

*Infections.* Premature babies are at risk for myriad of infections because their immune systems have not fully matured. Common infections in premature and low birth weight infants include bacterial, viral and fungal infections that affect the lungs, blood, brain and intestines. Because of the high risk for infections many babies are given antibiotics.

*Infant death.* Prematurity and low birth weight is the second leading cause of infant mortality in the first year of life the United States. The infant mortality rate is three times higher for preterm infants and over 68% of all infant deaths were in infants born prematurely.

**Sensory Conditions**

*Retinopathy of prematurity (ROP).* ROP is abnormal development of the blood vessels in the eye in premature infants that can lead to vision loss. The more premature the infant, the greater the risk of ROP. Ophthalmological examination and follow up is recommended for premature and low birth weight infants to look for and treat ROP. Most cases of ROP are mild and heal themselves with little or no vision loss. In more severe cases, an ophthalmologist may treat the abnormal vessels with a laser or with cryotherapy to protect the retina and preserve vision.

*Hearing impairment or loss.* Many of the treatments and complications of prematurity can impact the auditory system of the infant. Certain infections and various medications can damage parts of the system resulting in temporary or lasting hearing impairment or loss. About 8% of infants born premature or of low birth weight have a hearing impairment.

**Developmental delays, disabilities, and intervention**

Many infants born prematurely and with low birth weight catch up to their peers within the first two years of life. However, because of the myriad of medical complications infants born prematurely are at risk for developmental delays and disabilities. Given the sensory problems premature infants will exhibit, occupational therapy and/or a visiting nurse are best initial
sources for intervention. The lower the birth weight and/or the more prematurely the infant is born, the higher the developmental risk for delays in movement and coordination, language and cognition. Premature and low birth weight infants also have higher rates of learning disabilities, intellectual disabilities and cerebral palsy. As the child develops, therapists relevant to the child’s delays (e.g. developmental educator, speech-language pathologist) are most appropriate for continued intervention.

References


Center for Disease Control and Prevention (CDC), CDC Features, Premature Birth (n.d.). Available at http://www.cdc.gov/Features/PrematureBirth/


March of Dimes, Premature Birth http://www.marchofdimes.com/prematurity/


Resources

March of Dimes
Information about prematurity for families and service providers.
http://www.marchofdimes.com/prematurity/

Medline Plus

Permaurity.org
Volunteer supported website to support parents with premature infants.
http://www.prematurity.org/

MCH and Healthy people objectives
http://www.zerotothree.org/site/DocServer/Prematurity_Infants.pdf?docID=1921