What is "anemia" and how many people does it affect in the United States? The word anemia means that there are not enough red blood cells in the body to perform all of the body's functions. The main purpose of red blood cells is to carry oxygen to all of the tissues in the body. These red blood cells use iron to help carry oxygen to the cells in the body. This is why it is commonly stated that a person has "low iron" when they actually have low red blood cells.

Anemia in children and young adults is the most common blood problem diagnosed in the United States with approximately 1 billion people having anemia from nutritional deficiencies. These nutritional deficiencies can be from iron, vitamin B12 and folic acid. This is why it is very important to eat a diet that is well balanced and not avoid certain food groups. For instance, iron rich foods include meats, beans, spinach, fortified cereals and breads. Vitamin B12 is also found in meat and dairy products as well as eggs. Folic acid is in several fruits and vegetables like broccoli, spinach, and oranges.

Patients with anemia can have symptoms of low energy, more sleeping, decreased appetite, pale skin or nail beds and headaches. Depending on the age of the patient, symptoms may vary. For instance, an infant with anemia typically sleeps more than usual and feeds less often or tires easily with feeding. But an adolescent patient may notice that they are not able to perform physical activities as they did in the past or they get tired easier. They also may feel short of breath or develop chest pain. The symptoms of anemia can be very vague and difficult to figure out so most doctors will order testing which screens for anemia.

Testing for anemia includes a complete blood count (CBC) and a reticulocyte count (early red blood cells that increase in the bone marrow in response to anemia). The blood count measures the hemoglobin which is the substance in red blood cells that binds to oxygen. Hemoglobin uses iron to bind to the oxygen and transport the oxygen to your organs where the oxygen is released and keeps our organs healthy. The CBC also looks at the size of the red blood cell which helps the doctor determine what may be causing the anemia.

Anemia has several different causes which can be from the red blood cell being destroyed in the body after they are released from the bone marrow (increased destruction) or the bone marrow is not making enough red blood cells (lack of production) or there is acute blood loss or chronic blood loss over a long period of time. The hemoglobin, mean corpuscle volume (MCV), which looks at the size of the red blood cell, and reticulocyte count help to figure out the cause of the anemia. Some causes of anemia are listed below in the following categories:

Increased Destruction
1. Autoimmune hemolytic anemia- can be triggered by infection
2. Hemolytic anemia
        Sickle cell disease
        Spherocytosis
        Glucose-6-Phosphate Dehydrogenase deficiency
3. Infection mediated- these infections can cause the immune system in the body to attack the red blood cells
        Parvovirus
        Epstein-Barr virus
        Cytomegalovirus
        HIV
        Hepatitis
4. Ineffective bone marrow production (Defective hemoglobin)
        Sickle cell disease- cannot carry oxygen well
        Alpha thalassemia- not enough hemoglobin chains to carry oxygen well and abnormally accumulate iron
        Beta thalassemia- not enough hemoglobin chains to carry oxygen well and abnormally accumulate iron

Lack of production
1. Bone marrow failure
        Aplastic Anemia- white blood cells, red blood cells and platelets are decreased
        Diamond-Blackfann Anemia- red blood cells are decreased and no reticulocyte production
        Transient Erythroblastopenia of Childhood- triggered typically by an infection but the bone marrow for a short period of time does not make red blood cells or reticulocytes but then it goes away.
2. Cancer in the Blood or Bone marrow
        Leukemia cells take up space in the bone marrow and do not allow the bone marrow to make red blood cells. This will also affect white blood cell and platelet production.
3. Infection mediated- these infections interfere with the bone marrow making red blood cells
        Parvovirus
        Epstein-Barr virus
        Cytomegalovirus
        HIV
        Hepatitis
4. Nutritional deficiencies- growth cycle of blood cells relies on these vitamins and iron from the diet to allow blood cells to grow
        Iron- found in meat, beans, spinach, fortified cereal
        Folic Acid- found in fruits and vegetables
        Vitamin B12- found in meat products, dairy products, cheese and eggs

Acute blood loss (Blood loss quickly)
1. Blood loss through the gastrointestinal tract= need to test stool for the presence of blood
2. Blood loss through menstrual bleeding

3. Blood loss through blood in the urine
4. Any evidence of bleeding or increased bruising should be evaluated for a bleeding disorder with a Pediatric Hematologist

Chronic blood loss (Blood loss over a long period of time)
1. Associated with autoimmune diseases such as lupus, juvenile inflammatory arthritis

Doctors called Pediatric Hematologists also review blood smears and check the size of the red blood cell to help figure out what is causing the anemia. These things can give the doctor a clue about the cause of the anemia. They also look at the early red blood cells called reticulocytes which are made in the bone marrow and help compensate for low hemoglobin. When the reticulocytes are low, this can be a sign that the problem is the bone marrow production of red blood cells. When reticulocytes are high, this can be a sign that the problem is increased destruction of the red blood cells in the body. In some circumstances, a hematologist will need to check the bone marrow to see if there is evidence of red blood cell production and/or reticulocyte production in the bone marrow.

If you or someone you know is concerned that their child has anemia, please feel free to contact our office at 410-328-2808. We are more than happy to help figure out if your child has anemia.

Teresa York, MD
University of Maryland Children's Hospital
Pediatric Hematology/Oncology