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Iron Deficiency Anemia

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Introduction

What is Iron Deficiency Anemia (IDA)?

"Iron deficiency anemia is the most common type of nutritional disorder worldwide, occurring in both developing and developed countries and affecting as many as one-fifth of the world population" (Huether & McCance, 2018, p. 934). It is characterized as a microcytic-hypochromic anemia (which will be discussed in more detail in the Underlying Pathophysiological section). The American Society of Hematology (2019) reports iron is important in the production of hemoglobin and maintenance of healthy cells. It is estimated that IDK affects 2-6% of men and postmenopausal women and an astounding 10-15% women during childbearing age world wide (Calaf, Estadella, Feliu, Perelló, & Villamarín, 2018).

Why is IDA Important to the Advanced Practice Nurse?

It is very likely as an advanced practice nurse (APN) that medical care will be provided to patients with IDA. The APN will need to have a strong understand of the signs and symptoms of IDA. As well as, the pathophysiology and treatment options. The ability of the APN to diagnose and treat IDA is imperative because it is associated with increase morbidity and mortality. " For example, IDA may cause permanent cognitive impairment in children, fatigue or hear failure in adults, and serious maternal and fetal complications: (Cadet, 2018, p. 108).

Etiology

IDA has a wide variety of causes and it is important for the APN to take careful consideration of the patients history when determining the cause and treatment plan. Huether and McCance (2018) identify the causes of IDA as "(1) dietary deficiency, (2) impaired absorption, (3) increased requirements, and (4) chronic blood loss.

1) Dietary deficiency
- Dietary intake low in iron
- Children age 12-26 months as a result of prolonged breast feeding without iron supplement (Buchanan & Powers, 2017)

2) Impaired absorption
- Diets high in dairy
- Helicobacter pylori (H. pylori) gastrointestinal (GI) infections (Cadet, 2018)
- Bariatric procedures, especially gastric bypass surgery (American Society of Hematology, 2019)
- Proton Pump Inhibitors (PPI) use (Harmse, 2016)
- Chronic inflammatory disease

3) Increased requirements
- Pregnancy
- Growing infants, children, and adolescents (Huether & McCance 2018)

4) Chronic blood loss
- Menorrhagia
- Occult bleeding from ulcerative colitis, Crohn's disease, esophagitis, cancer of the bowels, hemorrhoids, and gastric/duodenal ulcers (Jones & Peate, 2014)
- Microscopic bleeding from the urinary tract (renal or bladder)

Pathophysiological Process

Most Common Signs and Symptoms of IDA

Signs (Objective Findings):
- Pale colored skin (especially in eyelids, tongue/mucous membranes, and palmar aspect of hands)
- Brittle nails
- Normal blood pressure (BP) in early or compensated stages and hypotension in late or uncompensated stages
- Tachycardia
- Tachypnea
- Altered mental status (AMS) or changes in the level of consciousness (LOC)
- Dysrhythmias (severe cases)

Symptoms (Subjective Finding/Patient Reported):
- May be asymptomatic (usually in the beginning stages)
- Fatigue/weakness
- Dizziness/lightheadedness
- Shortness of breath/dyspnea (especially on exertion)
- Palpitations
- Angina
- Headache

Underlying Pathophysiology

- IDK is characterized as microcytic-hypochromic anemia (see figure 1.) which can be defined as "abnormally small erythrocytes that contain unusually reduced amounts of hemoglobin" (Huether & McCance, 2018, P. 934)
- "Apart from its well-known function of an oxygen carrier in hemoglobin and myoglobin, iron is required for the efficient functioning of numerous other heme and non-heme enzymes" (Harmse, 2016).
- "Each hemoglobin molecule is compose of two pairs of polypeptide chains (the globins) and four colorful complexes of iron plus protoporphyrin (the hemes) responsible for the ruby-red color and oxygen carrying capacity" (Huether & McCance, 2018, p. 906). Therefore, when iron levels are low the body is unable to properly produce hemoglobin in the amounts necessary to create sufficient erythrocytes. This is what causes the signs and symptoms of IDA.
- Under normal functions iron is recycled when RBC are engulfed by macrophages; the body then stores the iron as ferritin and hemosiderin in the liver, bone marrow, skeletal muscles, spleen and duodenum (Harmse, 2016). When iron levels are low the body cannot keep up with the absorption and iron stores will eventually be depleted.
- Chronic inflammation causes increased production of hepcidin (iron regulatory hormone) which will decrease iron absorption in the GI tract (Harmse, 2016). Often times, non-steroidal anti-inflammatory NSAIDs) medications are prescribed for chronic inflammation which can increase a patient's risks for GI bleeding and worsen IDA.

According to Huether and McCance (2018) IDA can be broken down into three stages:
- In stage I, the body's iron stores are depleted. Erythropoiesis proceeds normally, with the hemoglobin content or erythrocytes remaining normal.
- In stage II, iron transportation to bone marrow is diminished, resulting in iron-deficient erythropoiesis.
- Stage III begins when when the small hemoglobin-deficient cells enter the circulation to replace the normal aged erythrocytes that have been removed from the circulation.
- The manifestation of IDA appear in stage III when there is depletion of iron stores and diminished hemoglobin production. (p. 935)

Significance of Pathophysiology

With the prevalence of IDA being so high it is important that APNs are vigilant in identifying the signs and symptoms of IDA early. APN must have a strong understanding of the etiology, pathophysiology, and treatment of IDA. As previously mentioned, it is estimated that IDK affects 2-6% of men and postmenopausal women and 10-15% women during childbearing age world wide (Calaf et al., 2018). Often times, the signs and symptoms of IDA can be vague and mimic other disorders or disease processes, which can delay the diagnosis. As identified in the previous section, IDA symptoms don't generally present until stage III, after the pathological process has been occurring for sometime. Late detection can lead to worsening symptoms, comorbidities, and mortality. This is especially concerning in patients that are young children, non-verbal, and normally confused, as they will not be able to provide the APN with presenting symptoms.

The Center for Disease Control and Prevention (CDC) (2017) list the following statistics for IDA in the year of 2017:
- 2.8 million out-patient office visits with IDA/anemia as the primary diagnosis
- 526,000 visits to the emergency department where IDA was the primary diagnosis
- 5,382 number of deaths caused by IDA

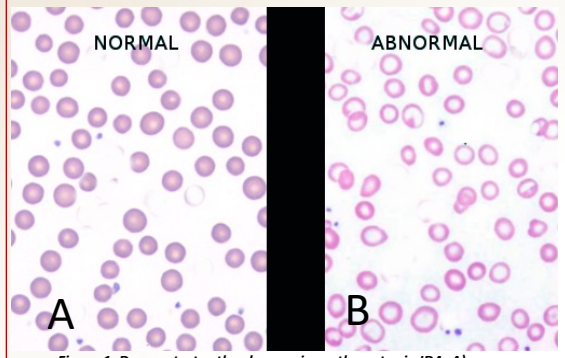

Figure 1. Demonstrates the changes in erythrocytes in IDA. A) normal erythrocytes. B) microcytic-hypochromic erythrocytes (Kamran & Warner, 2018).

Presentation of Case

Mr. Smith is a 51 year old, African-American male that presents with fatigue, occasional exertional shortness of breath, abdominal cramping, and intermittent headaches for the past 3 weeks. He has no known drug allergies (NKDA) and his only past medical history is ulcerative colitis (UC). He has smoked ½ pack of cigarettes per day for the past 30 years. During physical examination it is noted that his his skin color is normal but his oral mucosa and nail beds are pale and his nails are brittle. He is normotensive, his heart rate is 103 beats per minute (BPM) and his oxygen saturation is 97%. After further testing the following abnormal results were found for Mr. Smith: Guaiac positive, red blood cells (RBC) count is 2.9 M/mcl, hemoglobin is 8.1 g/dl, hematocrit is 26.1%, iron 21.6 mcg/dL, and ferritin 9.6 ng/ml. Mr. Smith is started on an oral iron supplement and instruction to take it 1 hour before or 2 hours after a meal with water or juice (not with dairy products). He is also prescribed a corticosteroid for the UC. He is referred to a gastroenterologist for a esophagogastroduodenoscopy (EGD) and colonoscopy. His is also given and order to have repeat lab work ordered in one month. He is encouraged to stop smoking and given the signs and symptoms that would mandate him to go to the emergency department.

Implication for Nursing Care

Assessment and Treatment Options

- When IDA is first diagnosed it is essential that the cause is found in order to best treat the condition properly.
- A complete history of presenting illness (HPI) and past medical history (PMI) must be obtained.
- A thorough physical assessment must performed to find the signs and symptoms of IDA.
- A complete blood count (CBC) will need to be ordered. Pay special attention to the red blood cells (RBC); hemoglobin (Hgb); hematocrit, mean corpuscular volume (MCV) RBC size; mean corpuscular hemoglobin (MCH) average mass of Hgb per RBC; mean corpuscular hemoglobin concentration (MCHC) average concentration of Hgb per a single RBC; and red cell distribution width (RDW) show variation of the RBC size and volume. (Cadet, 2018).
- Labs pertaining specifically to iron include: iron levels, total iron-binding capacity (TIBC), iron saturation, and ferritin.
- It is recommended to start by increasing foods rich in iron which include: meats (especially organ meats such as liver), poultry, fish, leafy green vegetables, legumes, dried fruits, and iron-enriched grain products (American Society of Hematology, 2019).
- "The first-line treatment for IDA is oral iron replacement therapy (e.g. ferrous sulfate, ferrous gluconate, ferrous fumarate) for 3-6 months for iron stores repletion" (Cadet, 2018, p. 109).
- Ferrous sulfate is most often the preferred iron salts replacement therapy for IDA treatment.
- "Intravenous iron administration, in some cases accompanied by erythropoietic agents, is recommended in patients with intestinal malabsorption, intolerance to oral iron supplement, severe anemia, or in those requiring rapid iron recovery (Calaf et al., 2018, p. 41).
- Lastly, blood transfusions with appropriately typed and screened RBCs my be necessary for Hgb below 7 g/dL or those who are extremely symptomatic.

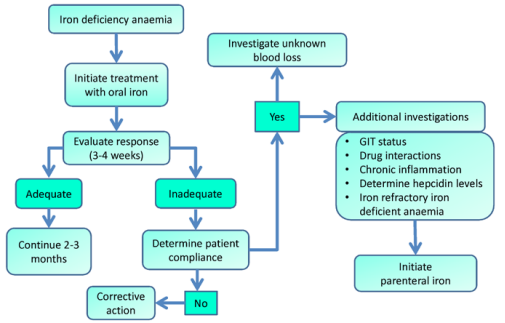

Figure 2. Flow diagram outlining the management of an iron deficient patient (Harmse, (2016).

Conclusion

In conclusion, IDA is the most common blood disorder worldwide in both developing and devolved countries. It is more common in women during child childbearing years and children, though it does affect men as well. IDA can be caused by a wide range of conditions, and it is important for APN to obtain a thorough PMI and HPI and perform a detailed assessment to look for the signs and symptoms of IDA. Correction of the cause, dietary changes, and iron replacement, either oral or parental is the the common treatment plan. Severe cases my require blood transfusion and hospitalization.

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