

CASE STUDY

SIDRA NASIM

CLINICAL DIETITIAN, RD

INDUS HOSPITAL



PRESENTING COMPLAIN

Mrs E is 34 year old lady, admitted in tertiary Care Hospital with c/o dizziness, fatigue, painful abdominal bloating, restless legs and drowsiness.

Vitals:

- Blood Pressure: 70/40 mm/Hg
- Respiratory Rate: 13 BPM
- Pulse: 126 BPM
- O2 Sat: 75 %
- Temp: 39 C

PAST MEDICAL HISTORY

- 10 days prior to presentation, she was hospitalized with an acute chest syndrome and found to have a methicillin-resistant *Staphylococcus aureus* (MRSA) pneumonia.
- She was transfused 2 packed red blood cells (RBCs) at the previous admission because of low HB (6.5 g/dl).
- She has a significant history of GI disturbance (bloating, diarrhea frequently)
- Had no history of jaundice
- Family Hx: Positive for DM but negative for anemia or any other hematologic disorder.

LABORATORY EVALUATION

- Hemoglobin (Hb): **5.8** ↓
- Hematocrit (Hct): **4** ↓
- MCV: **75** fL ↓
- MCHC: **22** g/dL ↓
- White blood cell count **14,200** ↑
- Platelet: **75000** ↓
- Total Bilirubin: **2.5** mg/dL ↑
- Serum Iron: **12** ug/mL ↓
- Total iron-binding capacity: **500** ug/mL ↑
- Saturation of transferrin **10%** ↓
- Serum Ferritin, **6** ug/mL ↓
- Reticulocyte count: **7 %** ↓

ANTHROPOMETRIC MEASUREMENTS

- She has a history of 5 kg weight loss in 1 month.
- Her current weight was 44kg with a height of 164cm.
- BMI: 16.4 kg/m²

CLINICAL PRESENTATION

- Pallor
- Lethargic
- SOB
- Low BP
- Yellow eyes

DIET HISTORY:

- Tobacco addicted
- Takes energy drinks frequently (one per day)
- Dislikes vegetables and has no milk intake
- Has very low fruit intake (1-2 per week)
- Consumed chicken mostly (4 days per week)
- Usually munching on processed foods .
- Improper meal timing

CURRENT MEDICATIONS

She undergone transfusion of 1 packed cell and prescribed following drugs by her doctors:

- Omeprazole
- Tetracycline
- Ibuprofen

After transfusion, her latest Hb was 7.5g/dL.

FINDINGS

DIAGNOSIS

IRON DEFICIENCY ANEMIA

WHAT SUBJECTIVE / OBJECTIVE SIGNS, SYMPTOMS AND LABORATORY TESTS ARE HELPFUL FOR THE DIAGNOSIS OF THIS PATIENT?

- SUBJECTIVE:

Fatigue, Dizziness, Restless legs,

- OBJECTIVE:

Pallor, Increased Heart Rate, Decreased saturation, Low Blood Pressure

- LABORATORY TESTS:

Low Serum Iron, Low Serum Ferritin, High TIBC

WHAT ARE THE SECONDARY ISSUES WITH THIS PATIENT?

- High Bilirubin: Jaundice
- Low Platelets: High risk of bleeding
- Increased WBCs count: Infection/ immune compromised

WHAT IS THE RDA OF IRON FOR WOMEN?

- Women: 18 mg
- Pregnancy: 27 mg
- Lactation: 10 mg
- Upper tolerable Limit: 45 mg

WHAT ARE THE CALORIC AND PROTEIN REQUIREMENT?

MIFFLIN-ST JEOR EQUATION:

$$\text{BMR} = 10 \times \text{weight (kg)} + 6.25 \times \text{height (cm)} - 5 \times \text{age (y)} - 161$$

$$\text{BMR} = 1134 \times \text{AF} \times \text{SF}$$

$$\text{BMR} = 1134 \times 1.2 \times 1.2$$

$$\text{BMR} = \mathbf{1632} \text{ calories}$$

$$\text{PROTEIN: } 1.5\text{gm/kg/day} = \mathbf{66\text{gms}}$$

WHAT ARE THE FACTORS PREDISPOSING THIS PATIENT TO IDA

- Inadequate utilization secondary to GI disturbance.
- Inadequate dietary intake.
- Inadequate absorption because of drug interference such as proton-pump inhibitors or tetracycline.

WHAT WILL BE YOUR TREATMENT RELATED GOALS?

- Control of the underlying causes of anemia
- GI issues should be corrected
- Dietary intake should be analyzed and modified
- Supplemental iron should be prescribed to replenish her stores and correct the anemia.

WHAT WILL BE YOUR DIETARY REGIME?

- Iron rich foods should be advised including red meat, peas, beans, nuts, etc.
- Increase consumption of Vitamin C rich foods with dietary intake of iron.
- Avoid foods that inhibit iron absorption including carbonated beverages, oxalates, phytates and excessive calcium intake.
- Encourage to increase intake of antioxidants.

DIET PLAN

Breakfast

- Orange (1 medium)
- Scrambled Egg
- Bread slice (2)

Midmorning

- Plums (3medium)

Lunch

- Green Pea Pulao (1 cup)
- Lentil ($\frac{1}{2}$ cup)
- Spinach ($\frac{1}{2}$ cup)
- Onion and tomato salad

Tea Time

- Chickpea Chaat (1cup)

Dinner

- Beef (3 oz)
- Chapatti (1 medium)
- Yogurt (1/2 cup)
- Strawberries (3medium)

Bed time

- Milk (1cup)

Total Calories 1685

Proteins 65.5 gms

Iron 18.25 mgs

WHICH MODE OF IRON THERAPY IS RECOMMENDED FOR THIS PATIENT?

Enteral or Parenteral?

GRADE (WHO)	DEGREE OF ANEMIA	TREATMENT
11-14 gm/dL	Normal	-
9-11 gm/dL	Mild	Oral iron therapy
7-9 gm/dL	Moderate	Parenteral iron therapy
<7 gm/dL	Severe	Blood transfusion

WHAT WILL BE THE DOSE OF IRON SUPPLEMENTATION?

The cumulative dose for repletion of iron is based on the patient's Hb and body weight, calculated by “**Ganzoni formula**”:

$$\text{Total body iron deficit/cumulative iron dose (mg)} = \text{Body weight}^* (\text{kg}) \times (\text{Target} - \text{Actual hemoglobin}) (\text{g/L})^{**} \times 0.24^{***} + \text{Iron for iron stores (mg iron)}^{****}$$

*Use ideal body weight in overweight patients. If underweight, use actual body weight

*** Hemoglobin must be in g/L (1x10)

***The factor 0.24= 0.0034 x 0.07 x 1,000: For this calculation the iron content of hemoglobin = 0.34%, blood volume = 7% of the bodyweight, and 1,000 is the conversion from g to mg

****Iron stores

<35 kg body weight = 15 mg/kg body weight

>35 kg body weight = 500 mg

Now Calculate:

44 kg female with a hemoglobin of 75 g/L needs a dose of $44 \times (110-75) \times 0.24 + 500 = 870$ mg iron

FOR HOW LONG THE DOSE WILL BE GIVEN?

- Dose of Venofer® (Iron sucrose) expressed as number of 5mL ampoules (each ampoule contains 100mg)
- Venofer® may be administered up to maximum of 200mg three times weekly.
- **Required Fe: 870mg = 9 ampule**
- Oral iron is not required after IV iron is given if the total iron deficit has been (or will be) repleted with IV iron therapy.

PARENTERAL IRON FORMULATIONS AVAILABLE IN PAKISTAN:

IV iron formulations	Brand names	Elemental iron	Rs/-
Iron Sucrose	Venofer Sangobion	20mg/ml 10mg/ml	1465/- 601/-
Ferric Carboxymaltose	Ferinject	50mg/ml (1vial=10ml=500ml)	6550/-
Iron Dextran	Cosmofer	20mg/ml	1250/-

SIMPLIFIED METHOD:

- The following table can be used for adult patients of body weight ≥ 35 kg.

Hb gm/dl	Body Wt 35 to <70kg	Body Wt ≥ 70 kg
<10g/dl	1500mg	2000mg
≥ 10 g/dl	1000mg	1000mg

DIFFERENCE BETWEEN FORMS OF IRON SUPPLEMENTS AVAILABLE ?

- The ferrous form of iron is absorbed three times more readily than the ferric form (iron pyrophosphate, iron protein succinylate, ammonium citrate-Vitaglobin, hydroxide Polymaltose- Maltofer)
- Although ferrous sulfate, ferrous gluconate, and ferrous fumarate are absorbed almost equally, each contains a different amount of elemental iron.

Common Compound	Elemental iron		Available Brands
Ferrous Sulfate (300mg)	20%	60mg	Ferrous sulphate, Fefol vit, iberet, unifer, fesovit-z, fenim, femorate etc
Ferrous Gluconate (500mg)	12%		Theron-F, neuro-vit, , irolic, amvit etc
Ferrous Fumarate (180mg)	33%		Iron plus, olifol, ,givitol, allifer, fefan etc

HOW WILL YOU MONITOR HER?

- Normalize the Hb and Hct concentrations and replete iron stores.
 - If the doses of iron are adequate, the reticulocyte count will begin to increase by the 3 to 4 day and peak by the 7 to 10 day of therapy.
 - By the end of the 2nd week of iron therapy, the reticulocyte count will fall back to normal.
 - The Hb response is a convenient index to monitor in out patients
Hematologic response is usually seen in 2 to 3 weeks with a 1 g/dL increase in hemoglobin and a 6% increase in the hematocrit.

CONT...

- Anemia can be expected to resolve in 1 to 2 months; however, iron therapy should be continued for 3 to 6 months after the hemoglobin is normalized to replete iron stores.
- Therapy duration is related to the absorption pattern of iron.
 - During the first month of therapy, as much as 35 mg of elemental iron is absorbed from the daily dose.
 - With time, the percentage of iron absorbed from the dose decreases, and by the third month of therapy, only 5 to 10 mg of elemental iron is absorbed.

POINTS TO CONSIDER WHILE COUNSELLING THE PATIENT?

- Oral iron therapy produces dark stools.
- Take iron on an empty stomach.
- Counselling should also be given for GI discomfort which can be caused by oral iron supplement.

WHAT ARE THE OTHER INDICATIONS FOR PARENTERAL IRON THERAPY?

Initiate PN iron therapy when the oral does not work which can be caused by:

Reason	Example
Inadequate iron intake	Non-adherence, insufficient iron content in supplement
Inadequate iron absorption	Concomitant consumption of inhibitors of iron absorption (e.g. tea, calcium) Coexisting inflammation with iron sequestration Intestinal mucosal disorders (e.g. coeliac disease) <i>Helicobacter pylori</i> infection Impaired gastric acid secretion (use of proton pump inhibitors)
Ongoing blood losses	Occult blood loss
Coexisting condition interfering with bone marrow response	Concomitant vitamin B ₁₂ or folate deficiency, primary bone marrow disease
Incorrect diagnosis	Haemoglobinopathy, anaemia of chronic disease or renal failure

IS THERE ANY DRUG-NUTRIENT INTERACTION?

- Proton pump inhibitor, inhibits serum iron and vitamin B12 absorption by increasing the pH of the stomach and decreasing the solubility of ferrous salts.

What to do: Take iron at least 1 hour before or 3 hours after the proton pump inhibitor dose. Absorptions of both iron and tetracycline are decreased when administered concomitantly, the iron should be taken 3 hours before or 2 hours after the tetracycline dose as well.

ANY OTHER SUPPLEMENTATION?

- The recommended dose of vitamin B12 is 500 mcg (PO) per day depend upon the lab value.
- Maintaining depleted stores requires an absolute minimum oral intake of 50 to 100 mcg of folic acid daily.

REFERENCE

- Krause food and the nutrition care process 14th edition.
- World health organization guideline summaries
- Journal Australian prescriber v.36 (6), 2016 dec

THANK YOU 😊