



## Review Article

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## IRON DEFICIENCY ANAEMIA IN PREGNANCY: A REVIEW

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## ABSTRACT

India's high prevalence of iron-deficiency anaemia is primarily due to the vegetarian diet in women. Malnutrition is due to low economic condition, generally poor nutrition, insufficient protein & iron diet, inadequate iron absorption, and expanded requirements. Adopting this lower level, anaemia in pregnancy ranges widely from 40 to 80% in the tropics compared to 10 to 20% in developed countries. Anaemia is responsible for 20% of maternal deaths in third world countries. Approximately 51% of pregnant women are anaemic. Of all anemias diagnosed during pregnancy, 75% are due to iron deficiency.

**Keywords:** Microcytic hypochromic anaemia, Pandu, IDA.

## INTRODUCTION

Anaemia is derived from the Greek word anaemia, meaning lack of blood. Anemia is the single most common hematological problem faced by women. The most common anemia is iron deficiency microcytic anemia and folate deficiency megaloblastic anemia. Iron deficiency alone is nearly 20% of the world's population. Approximately 51% of pregnant women are anemic, including 56% in developing countries and 18% in developed

countries. The WHO has estimated that considering all forms of anaemia. From 16,800 to 28,000 women of reproductive age die annually from anaemia, with the most significant risk in younger women. Of all anemias diagnosed during pregnancy, 75% are due to iron deficiency. Deficiencies of iron, folate and vitamin B12 result in unique clinical consequences. The adverse effects of iron, folate and vitamin B12 deficiency extend beyond the mother's health to the developing fetus during pregnancy. Grading of anaemia according to its severity.<sup>1</sup>

Table 1: Grading of anaemia according to its severity

Hemoglobin Concentration (g/dl)	AIDS Clinical Trial Group	World Health Organization	National Cancer Institute	Indian Council of Medical Research
Mild	8.0-9.4	10-10.9	10 to >normal*	10.0-10.9
Moderate	7.0-7.9	8-9.9	8.0-10.0	7.0-10.0
Severe	6.5-6.9	7.9-7	6.5-7.9	<7.0
Very severe/life-threatening	<6.5	<7.0	<6.5	<4.0

\*Normal is defined as 13.7-17.5g/dL for men and 12-16g/dL for women

Source: Brokering KL, Qaqish RB. Management of anaemia of chronic disease in patients with the human immunodeficiency virus. *Pharmacotherapy*. 2003;(11):1475-85.

Of all anaemia diagnosed during pregnancy, 75% are due to iron deficiency. The adverse effects of iron folate & vitamin B12 deficiency extend beyond the mother's health to the developing fetus during pregnancy. Demand Increases for iron from 0.8mg/dL early in pregnancy to 7.5mg/day in late pregnancy.

Table 2: Iron requirement during pregnancy<sup>2</sup>

Reasons for iron requirement	Amount of iron required (mg)
Iron actively transferred to the fetus	270
Iron lost through various routes of excretion	170
Iron transferred to placenta and cord	90
Iron utilized due to expansion in the maternal volume of circulating erythrocytes	400-500
<b>Total iron requirements</b>	<b>980-1,000</b>

Table 3: Effect of anaemia<sup>3</sup>

On mother	On fetus
Recurrent infection	Stillbirth
Maternal risk during the antenatal period: Preterm labour, Abortion, placenta previa, eclampsia, poor weight gain.	IUGR, Premature birth
PIH, CCF	Neonatal anaemia, Fetal distress, Impaired neurological and mental development.
Obstetric shock	Perinatal mortality (increased 3-fold when Hb <7.5g and increased 10-fold when Hb <5g)
Puerperal sepsis, Subinvolution.	----

## CLASSIFICATION

Anaemia may be classified in various ways.

1. Physiological anaemia of pregnancy
2. Pathological anaemia

- Deficiency anaemia (isolated or combined)-iron deficiency, folic acid deficiency, vitamin B12 deficiency, protein deficiency.
- Hemorrhagic-Acute-APH. -Chronic: Hookworm infestation, bleeding pile, etc.
- Hereditary- Thalassemia, sickle cell hemoglobinopathies, hereditary hemolytic anemias.
- Anaemia of infection-malaria, tuberculosis, kala-azar.
- Chronic diseases – renal or neoplasm.
- Hematologic malignancy-leukaemias, lymphomas.
- Hemolytic-SLE, HELLP syndrome, drug-induced G6PD deficiency.<sup>4</sup>

## CONCEPT OF PHYSIOLOGICAL ANAEMIA

The modest fall in hemoglobin levels during pregnancy is caused by a relatively more significant expansion of plasma volume than the increase in red cell volume. The disproportion between the rates at which plasma and erythrocytes are added to the maternal circulation is most remarkable during the second trimester.<sup>5</sup> Even an adequate diet cannot provide this extra demand for iron. The anaemia is normocytic and normochromic in types.

There always remains a physiological deficiency state during pregnancy, which, if not fulfilled, will lead to complications. So, a pregnant woman is given the prophylactic supplement of iron therapy and other compounds.

### Cause of iron deficiency in anaemia

- Inadequate dietary vitamin C may reduce the absorption of iron.
- Zinc and vitamin A deficiency also predispose to iron deficiency.
- Multiple pregnancies progressively add to the iron deficit.
- Nutritional causes-iron deficiency anaemia (60%)
- Dimorphic anemia both due to deficiency of iron and folic acid
- Hemolytic anaemia -hemoglobinopathies, DUB, menometrorrhagia, cancer.
- Anaemia due to blood loss-acute-acute blood loss
- Chronic-hookworm infestation, bleeding piles, malarial infection
- Faulty dietetic habit- There is no iron deficiency in the diet. Still, the diet is rich in carbohydrate high phosphate & phytic acid help in forming insoluble iron phosphate & phytates in the gut, thereby reducing iron absorption.

Pre-pregnancy health status- Most tropics start pregnancy in a pre-existing anemic state with reduced iron reserve.

- Excess demand-

- i) Multiple pregnancies increase the iron demand by two-fold.
- ii) Women with rapidly recurring pregnancies need more iron to replenish deficient iron reserve within two years following the final delivery.
- iii) Twin pregnancy when iron demand is high.

### Iron deficiency anaemia

Iron deficiency is the most prevalent single nutritional deficiency, affecting as many as 200 million of the world's population. Of the individuals with iron deficiency, 50% progress to iron deficiency anaemia. In developed countries, the risk of iron deficiency appears to be greatest among low-income women during and after pregnancy despite the documented increases in the iron intake of infants and children. Pregnancy, however, increases the need for maternal iron to supply fetal iron needs and to withstand the physiologic-iron deficiency anaemia during pregnancy.

Body iron distribution- storage (liver>marrow>spleen)

- Men 1000mg
- Women 500mg
- Plasma 3mg
- Red cells 2000mg
- Other cells 1000mg
- Recirculation 20 mg

(Red cells to the spleen to plasma or marrow to red cells)

### Iron homeostasis during pregnancy

Changes in iron homeostasis during pregnancy reflect maternal physiologic changes and fetal demand for iron. Maternal plasma volume begins to increase starting at about six weeks gestation. Fetal iron needs in the first trimester are about 2mg per day, 4 mg per day in the second trimester and 6 mg per day in the third trimester. Approximately 1245 mg of iron to meet the demands of pregnancy, labor and delivery, basal maternal needs are 240 mg, 450 mg augments of maternal blood volume, 80mg deposits in the placenta, 225mg are required for fetal need, and 250mg is lost during standard vaginal delivery. The needs are met first by maternal tissue stores and then by increased absorption.<sup>6</sup>

## CLINICAL MANIFESTATION

**Early-stage** -Not specific, fatigue, anorexia, dyspnea, lassitude, breathlessness.

**Advanced stage**- Generalized oedema (anasarca), heart failure, angina. Pica is seen in iron deficiency anaemia.

**Sign**- pallor, oedema, cardiac dilatation, glossitis, koilonychia, brittle hair, angular stomatitis.

Rule out TB, chronic renal disease, splenomegaly, and jaundice is a clue to the underline hemolysis.

**Investigation**- Usual investigation

- **CBC:** It is the first test ordered which determines the severity and types of anaemia (microcytic anemia or small red blood cells, normocytic anemia or average-sized red blood cells, or macrocytic anemia or large-sized red blood cells)
- **Peripheral blood smear:** Looks at the red blood cells under a microscope to determine the size, shape, number, and color, as well as evaluate other cells in the blood.
- **Stool hemoglobin test:** Test for the blood in the stool, which may detect bleeding from the stomach or the intestines.
- **Bilirubin:** To determine hemolytic anaemia.
- **Liver function test:** To rule out liver pathology.

**Further investigations-** Hemoglobin electrophoresis

- Reticulocyte count
- Bone marrow biopsy

**Diagnosis of iron deficiency anaemia**

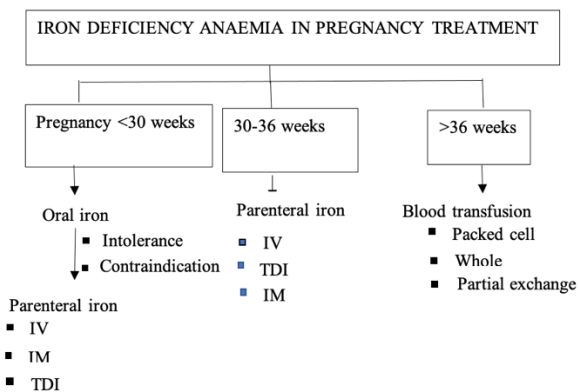
- Hb <11.0g/dl
- MCV-Normal MCV (76-96fl) with low hemoglobin is typical of pregnancy.
- Serum ferritin 10-50g/dl need monitoring and <10g/dl requires treatment.
- Iron deficiency anemia during pregnancy is the consequence primarily of expansion of plasma volume without normal expansion of maternal hemoglobin mass.

**PREVENTION**

When caused by inadequate iron intake, iron deficiency anaemia can be prevented by upon current knowledge of normal iron homeostasis is 5 to 10mg/day. Dietary bioavailability is determined by the iron content and the presence of inhibitors of absorption such as phytates in the bran, tannins in tea and polyphenols in certain vegetables versus enhancers such as eating a diet high in vitamin C & iron-rich food. For many years, it has been recognised that vitamin C is essential for iron absorption from the gastrointestinal tract. The dietary allowance for iron, based on heme iron in red meat, fish and poultry, and vitamin C. Iron stores vary from 1.0 to 1.4 grams of body iron in men to 0.4 grams in women.

**Diet-iron rich diet-** Green leafy vegetable, cauliflower, dates, spinach, jaggery, cereal, beans, egg.

**Prophylactic oral iron therapy-** iron :60mg elemental iron/day



**Flowchart 1: Iron deficiency anaemia in pregnancy treatment** <sup>7</sup>

**Folate B<sub>12</sub> deficiency and Hyperhomocysteinemia, and Vitamin**

Among the many metabolic changes that occur during pregnancy, the metabolism and maternal requirement of vitamin B<sub>12</sub> and folate have received much attention due to the spectrum of clinical diseases associated with their deficiencies. The recognition many years ago that folate deficiency was associated with neural tube defect, research now indicates that folate, vitamin B<sub>12</sub> and homocysteine play a role in maternal and fetal health and may affect the health of older adult women.

**The diagnosis of Folate and B<sub>12</sub> deficiency**

The diagnosis of folate and vitamin B<sub>12</sub> deficiency has been a complication by discovering that mild forms without overt clinical symptoms may be missed on basic screening tests using direct measurement of these vitamins. Common to both folate and B<sub>12</sub> deficiency is megaloblastic/ microcytic anemia, often accompanied by hyper-segmentation of granulocytes. It is important to note that iron deficiency can coincide with B<sub>12</sub> or folate deficiency with a resulting 'normocytic' anemia as measured by a coulter counter.

**Causes of falsely raised or depressed B<sub>12</sub> levels**

- **Falsely depressed B<sub>12</sub> levels:** Folate deficiency, myeloma, high-dose vitamin C intake
- **Falsely increased B<sub>12</sub> levels:** Liver disease, autoimmune diseases, myeloproliferative states.

**Folate and Vitamin B<sub>12</sub> requirements in adults and during pregnancy**

- **Folate** - The estimated folate intake for adult men and women has been 280 mcg and 210mcg per day. The current recommended daily folate intake for an adult is 400mcg daily. 100-150mcg per day of women of childbearing age.
- **Vitamin B<sub>12</sub>**- Daily intake of vitamin B<sub>12</sub> from 2.2mcg daily to 2.4 mcg daily during pregnancy.

**Neuropsychiatric manifestation of B<sub>12</sub> deficiency**

**Spinal cord changes**

- Posterior column symptoms- Paresthesia in fingers and toes, Incoordination of leg
- Lateral column symptoms -weakness of leg>arms, spasticity of leg>arms
- Central nervous system changes- Dementia, personality changes.

**Folic acid therapy-** in megaloblastic anemia, PCV may be as low as 10-16%, patients with severe glossitis (IM) folic acid 1 mg /day for 7 days, Reticulocytotic occurs within 3-4 days.

**Vitamin B<sub>12</sub> therapy-** Megaloblastic anemia due to vitamin B<sub>12</sub> deficiency. 250 mcg cyanocobalamin IM every week.

**Diet-** yeast, legumes, broccoli, milk, cheese, meat, egg, mushroom.

**DEFINITION: IN AYURVED, ANAEMIA IS CALLED PANDU**

*Panduta* means pallor; it is the most common characteristic of all the varieties -*pandu roga*, which is observed in palpebral conjunctiva, skin, face, nail, and urine. There is a reduction in the redness of blood; therefore, it is called *pandu roga*.

The disease *pandu roga* is said to be *rasa pradoshaja rogas*. *Rasavaha srotas* are consistent with the *rasa*, the first dhatu produced by the proper digestion of *aahar*. This *rasa dhatu* carries all the necessary nutrients required to form the remaining

*dhatu*; if there are any abnormalities in the *jatharagni* and *rasadhivagni*, the effect of formation of all *dhatu*. Ultimately it is responsible for *pandu* & maternal, fetal health.

**Classification of *pandu roga*** :1. *Vataja pandu*, 2. *Pittaja pandu*, 3. *Kaphaja pandu*, 4. *Tridoshaja pandu*, 5. *Mrudbhakshanjanya pandu*

In Ayurveda, pregnancy-induced anemia is not mentioned, directly but *kashyapa* and *harita Samhita* described pregnancy-induced anemia disease of discoloration of the skin (*Vaivarnya*), which occurs in anemia.

The sign and symptoms of different types of this disease, several types of complexions like *harita* (green) are described. But all of these are dominated by *panduta* (pale yellow colour) because of which this disease is called *pandu- roga*, and an identical statement in Sushruta supports this: *Uttara -tantra 44:2 8 Vataja pandu*- Constant use of *vata* provoking food and activities vitiates *vata* and causes *vataja pandu*.

*Vataja pandu* is correlated to anemia caused due to malnutrition, which includes iron, protein, vitamin B, C, and D deficiency necessary for the maturation of RBC and synthesis of hemoglobin.

**Clinical features of *Vataja pandu***:1. Dry skin, 2. Loss of stamina, 3. Headache, 4. Body ache, 5. Dry stool, 6. Tremor, 7. Edema

**Clinical features of *Pittaja pandu***: 1. Yellow sclera, Urine, stool, and skin, 2. Excessive sweating, 3. Excessive thirst, 4. Bitter taste, 5. Burning sensation in abdomen

**Clinical features of *Kaphaja pandu***: 1. Edema, 2. Severe paleness in conjunctiva, 3. Anorexia, 4. Giddiness, 5. Drowsy, 6. Heaviness in the body, 7. Loss of appetite.

**Clinical features of *Mrudbhakshana pandu***: 1. Loses stools with mucus and blood, 2. Loss of strength, stamina, appetite and oja, 3. Edema in orbital area, 4. Number of intestinal parasites in stools.

**Samprati Ghataka**

*Dosha-Pitta*

*Dushya – Rasa Dhatu.*

*Srotas – Rasavaha Srotas, Raktavaha Srotas.*

*Adhithana – Raktavaha.*

**CHIKITSA OF PANDU ROGA**

1. *Snehana*.

2. *Shodhana- virechana*

3. *Shamanaushadhi*

4. *Pathyapathya*

1. *Snehana* – For the administration of *snehana*, *ghrita* is preferred, not *taila*. *Dalhana* commenting on *Snehana* says that *pandu roga* is pitta predominant disease. *Ghrita* is the development of skin, especially for dry skin. Hence *ghrita* is ideal for *snehapana*. (*Dalhana* su. Utta.44). *Ghrita* is the *Tikta Rasa*, *Pittashamak*. *Pittarasa* enlightens the *agni*. Any one of the following *ghritas* are used for *snehana* –

- *Panchagavya ghrita*
- *Mahatiktaka ghrita*
- *Kalyanaka ghrita*
- *Dadimadi ghrita*

2. *Swedana* – After *snehapana* is usually adopted, but *swedana* is contraindicated in pregnancy.

3. *Virechan- Dalhana* says that *virechan* is contraindicated in *garbhini pandu roga* <sup>9</sup>

- *Aulomana* with *Amalaki*, *Draksha*, (*Vamana* and *virechana* is contraindicated in pregnancy)

- Replenish the deficient *dhatu*.

*Visaladi- Phanta*

*Navayasa – Curna*

*Trapani – Yoga*

*Yogaraja*

*Punarnaya -Mandura*

*Darvyadi- Leha*

*Mandura- Vataka*

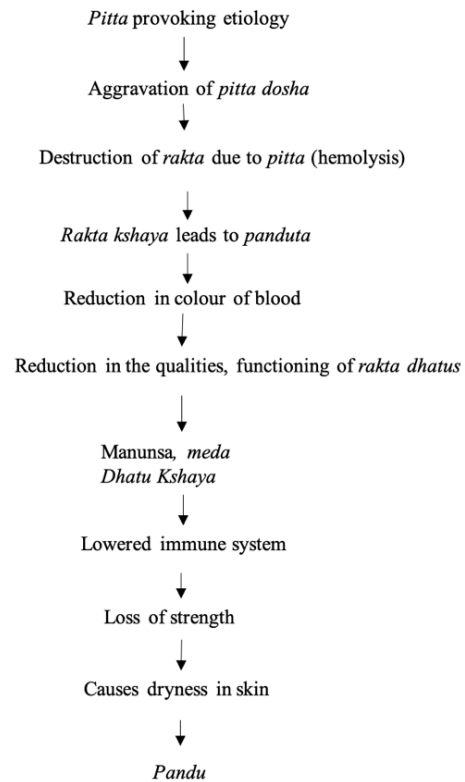
*Dhatryarista*

*Dhatryaveleha*

***Pathya*** – Rice, Milk, Wheat, Ghee, Buttermilk, *Guda*.

***Apathya*** - Heavy physical exertion, anger, walking a longer distance, working of hot place.

**SAMPRAPTI**



Flowchart 2: *Samprapti* <sup>10</sup>

**IN THIS CLINICAL OF DHATRIVALEHA**

*Dhatriavaleha* contains,

1. *Amalaki*– (*Dhatri*) Rich in Vitamin C, Galic acid, Calcium which helps for Iron absorption essential for the formation of hemoglobin and Influence of *amla* fruit (*Emblica officinalis*) on the bioavailability of Iron from staple cereals and pulses.<sup>9</sup> Ascorbic acid plays a critical role in converting ferric iron to ferrous iron and help its absorption in the body. *Dhatri* also improves the quality of *rasa dhatu* and act as *pittashmak*.

2. *Pippali* – Piperine. *Pippali* is *deepan* hence enlightening the *agni* and *pachan* *Pandu hara* (*Bha pra*). The use of *Pippali* in the mode *yogavahi*.
3. *Yastimadhu* – Glycyrrhizin. It acts on *balavarnakrita*, *shothahara*
4. *Shunthi Zingiol*- *Dipan* thus enlightens the *agni* and helps *pachan*. And *pandu hara* (*Bha Rra*).
5. *Draksha*- Tartaric, malic, Citric and Iron-rich, *Vatapittasamaka*. *Draksa* is cooling and controls the aliments due to *rakta* and. It is a very good appetizer. *Draksa* is a very sweet and blood purifier.<sup>11</sup>
6. *Vanshalochana* - *Vanshalochana* is essential, Protein, Silica.<sup>12</sup> *Vanshalochana* is dry, sweet and cooling. It purifies the blood and alleviates the *pitta dosa*.
7. *Ghrita*- Contain vitamin A; many times, especially *vataja pandu*, have deficiency symptoms and anemia. A part of vitamin B and C vitamin D is also necessary for erythropoiesis. *Ghrita* as good *yogavahi*. i.e., by treating with appropriate substances, it multiplies in efficacy. It improves digestive power.

All these drugs have the property to increase the iron levels in the body & non-harmful in pregnant women. *Garbhni pandu* can be co-related with iron deficiency anaemia due to poor absorption. So *Dhatriavaleha* may be correct.

## CONCLUSION

*Acharya Charak* has also described “*pandutva*” as a *Rasa pradoshaya vikara*. In Ayurveda, many formulae are described for anaemia; among them, *Dhatriavaleha* is described in *Charaka Samhita Chikitsasthan*, 16/100-101. *Amalaki* is rich in Vitamin C, which helps with iron absorption. *Dhatri* also improves the quality of *rasadhatu* and act as *pittashmak*. *Pippali* is the *deepan*; hence it enlightens the *aagni*. *Yastimadhu* acts on *balavarnakrita*, *shothahara*. *Shunthi* is *dipan*, thus illuminating the *agni* and helping in *pachan* also. *Draksh* is an iron-rich compound. *Vanshalochana* it purifies the blood. *Ghrita* improves digestive power.

## REFERENCES

1. Hematological Complication in Obstetrics, pregnancy and Gynecology. Editor in chief Rodger L. Bick. Iron deficiency,

- folate, and vitamin B<sub>12</sub> deficiency in pregnancy, obstetrics and gynaecology. P 273.
2. Dr. Hemalatha Kapoorchand. A Comprehensive Treatise on *Prasuti -Tantra* Obstetrics (according to new CCIM syllabus). Disorder in pregnancy and their management. Chaukhamba vishwasbharti publication. First Edition 2016. P 509, 511.
3. Williams. Obstetrics Hematological Disorder, Edition- 22. McGraw-Hill Education/ Medical. Chapter 51, P 1144.
4. Hematological Complication in Obstetrics, pregnancy and Gynecology. Editor in chief Rodger L. Bick. P 271.
5. Hematological Complication in Obstetrics, pregnancy and Gynecology. Editor in chief Rodger L. Bick. P 292.
6. R. K Sharma, Bhagwan Dashe. Caraka Samhita (Text with English Translation & Critical Expositioased on Cakrapani Datta’s Ayurveda Dipika). Chaukhamba vishwasbharti publication. By-. Edition-2019. Volume: IV, Chapter XVI. P 82,84.
7. Hiralal Konar. DC Dutta’s Textbook of Obstetrics. Medical and Surgical Illness Complicating Pregnancy. Jaypee publication 9<sup>th</sup> edition, Chapter 20, P 254
8. Ajai Kr Pandey, Parameswarappa S Badges. Essential of *kayachikitsa- Aruna, pandu*, First edition 2008. Volume -1. P 45,46,53,56
9. Ajai Kr Pandey, Parameswarappa S Badges. Essential of *kayachikitsa- Aruna, pandu*, First edition 2008. Volume -1. P 45,46,53,56
10. Influence of amla fruits (*Embllica officinalis*) on the bioavailability of Iron from staple cereals and pulses. Nutrition Research 2001;21(12): 1483-1492.
11. Raj Nighantu by Dr. Satish Chandra Sankhyadhar forward by Prof. K.C. Chuneekar. Edition: First 2012, Reprint Edition: 2017. P 582.
12. Dr Gyanendra Pandey. Dravyaguna Vijnana (English-Sanskrit) Part 1. Edition – First 1998. P 102, 162, 179, 452.

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