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REVIEW ON IRON DEFICIENCY ANAEMIA OF ADOLESCENTS AND RATIONALITY OF TILA, GUDA, SOYABEAN IN ITS TREATMENT

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ABSTRACT

Anemia Pandu Roga is one of the common problem in the developing countries like India specially in women and adolescents. Iron deficiency anaemia (IDA) is the commonest form of anaemia in adolescents. Anaemia is typically the first clue to iron deficiency, but an isolated haemoglobin measurement has both low specificity and low sensitivity. The optimal diagnostic approach is to measure the serum ferritin as an index of iron stores and the serum transferrin receptor as a index of tissue iron deficiency. So our main aim is to improve the iron level in body by supplement foods or medicines rich in iron content. Tila, Guda and Soyabean are rich source of iron and they contain good nutritive value also. They treat anemia by improving the iron content and agni i.e. digestive power by which healthy tissues can be formed.

KEYWORDS: Adolescents, Anemia, Ferritin.

INTRODUCTION

Iron deficiency anaemia is a problem of serious public health significance, in terms of its impact on psychological and physical development, behaviour and work performance. It is the most prevalent nutritional problem in the world today, affecting more than 700 million persons. Simply stated, an iron deficiency occurs when an insufficient amount of iron is absorbed to meet the body's requirements. This insufficiency may be due to inadequate iron intake reduced bioavailability of dietary iron, increased needs for iron, or to chronic blood

loss. When prolonged, iron deficiency leads to iron deficiency anaemia. Iron deficiency is by far the commonest nutritional cause of anaemia; it may be associated with a folate deficiency, especially during adolescent. Other nutrient deficiencies such as vitamin B, pyridoxine and copper are of little public health significance because of their infrequency. In Ayurveda Pandu roga is correlated as anemia and it is Pitta predominant disease. Infants, preschool children, adolescents and women of childbearing age, particularly pregnant women, are at greatest risk of developing iron deficiency anaemia. However, adult males may also be at risk, especially where there is inadequate food intake or frequent parasitic infestation. Anaemia may be caused not only by a deficiency of iron but by other conditions. Malaria, hookworm disease (whether ancylostomiasis or necatoriasis), schistosomiasis and other infections play an important role in tropical. India has the highest prevalence of iron-deficiency anaemia. In India, adolescent girls, who constitute a sizable segment of its population form a vulnerable group and are at a greater risk of morbidity and mortality. It is the shaping period of life when maximum amount of physical, psychological and behavioral changes take place. This is a vulnerable period in the human life cycle for the development of nutritional anaemia.[1] Adolescent girls are particularly prone to iron deficiency anemia because of increased demand of iron for hemoglobin, myoglobin and to make up the loss of iron due to menstruation and poor dietary habits.[2] So we need to regulate the diet of patient by giving them iron rich food. In this respect chart of foods which is rich in iron is given below.

Dietary Sources of Iron that can prevent Iron Deficiency Anaemia.

Food Stuffs	Iron mg/100g	Food Stuffs	Iron mg/100g
Cereals		**Green leafy vegetables**	
Bajra	8.8	Coriander	10.0
Barley	3.7	Drumstick	7.0
Cholam (Sorghum)	6.2	Radish leaves	4.8
Maize yellow	2.1	Spinach	5.0
Oat meal	3.8	**Fruits**	
Ragi	5.4	Pine apple	1.2
Rice, Paroboiled milled	3.7	Grapes	1.5
Rice, raw milled	2.8	Lemon	2.3
Legumes		Banana	0.9
Bengal gram dal	8.9	Pomegranate	0.3
Black gram dal	9.8	Apple	1.0
Cow gram	3.8	Pear	0.5
Field bean dry	5.0	Orange	0.32
Green gram dal	8.4	Mango	0.3

Red gram dal	8.8	Guava	1.0
Soyabean	11.3	**Meat and Fish and eggs**	
Nuts and Oil Seeds		Egg	2.1
Sesame seeds	10.5	Fish	2.3
Cashew nut	5.0	Liver goat	6.3
Ground nut	1.7	Mutton goat	2.5
		Miscellaneous foods	
		Jaggery	11.4

Source - Swaminathan, M. "Essentials of food and nutritions", Fundamental aspects, Vol. I, Ed. II, Page 384-394, 2003.

Food stuffs rich in iron content

Food Stuff	Iron (mg/100g)
Sesame seeds	10.5
Jaggery	11.4
Soyabean	11.3

Recommended RDA 21-32 mg iron/day for adolescent Girls and Boys. If we can included our diet Tila, jaggery & Sesame seeds that we can found total 33mg iron.

Among this our main focus is on Sesame seed (Tila), Jaggery and Soyabean seeds because they are rich in iron content than others.

METHODOLOGY

Scientific papers published on the subject of iron deficiency anemia in adolescents were selected for inclusion. Literary work was taken from Charak, Sushruta, Kirti Kar & Basu, Nighantus & several other books consulted. Finally, an analysis was conducted and the papers were evaluated in accordance with the study objectives.

Causes of iron deficiency anaemia in adolescents

Major causes of iron deficiency anaemia are-

1. The main causes of anaemia are nutritional and infectious. Among the nutrition factors contributing to anaemia, the most common one is iron deficiency. It is due to a diet that is monotonous, but rich in substances (phytates) inhibiting iron absorption so that dietary iron cannot be utilised by the body.[3]
2. Malaria is another major cause of anaemia: it affects 300-500 million people, and in endemic areas it may be the primary cause of half of all severe anaemia cases.[4]

- Due to hook worm infestation- occult blood loss.
- Starting menarche
- Growth spurt with a suboptimal haematopoitic contents.
- Gender discrimination.
- Intensive exercise conditioning as occurs in competitive athletics iron depletion in girls.
- Early marriage with pregnancy.
- Excess blood loss during menstruation.

The pathophysiology of iron deficiency anaemia

The most important protein as far as iron reserves are concerned is ferritin, which is found in almost all the cells of the body, iron reserves being situated principally in organs such as the spleen, liver and bone marrow.[5,6] Serum ferritin level is the most accurate indicator of body iron stores.[7] Plasma ferritin levels decrease when there is a deficiency of iron that is not complicated by another concomitant disease. This reduction in ferritin occurs early, well before the abnormalities in haemoglobin levels, serum iron levels or in erythrocyte size become apparent. Serum ferritin, when used alone as a single parameter, is not considered a good indicator of the nutritional iron status of a population, since this measurement does not provide all the information necessary on the prevalence of anemia.[8,9] To reach a definitive diagnosis of iron deficiency anaemia, in addition to performing a full blood count (haemoglobin, haematocrit, red blood cell count), ferritin and serum iron levels should be measured.[8,10] Iron homeostasis is regulated principally by iron absorption rather than excretion; therefore, serum iron level reflects the balance between the amount of iron absorbed and the amount used by the body.[5,6] Iron deficiency develops gradually and progressively until anaemia is established.[9,11] The first stage of anaemia consists of iron depletion or a negative iron balance. It is characterized by a period of greater vulnerability (affecting iron stores) and may progress slowly to a more severe deficiency, with functional consequences. As iron stores deplete, ferritin levels fall, with iron values < 12 ng/ml corresponding to depleted iron stores.[12]

The second stage, also referred to as “iron deficiency”, is characterized by a phase of erythropoiesis. Iron is depleted, but anaemia is not yet present, although biochemical abnormalities reflect its inability to produce haemoglobin normally. The transferrin saturation index is < 16% and there is an increase in red cell distribution width (RDW) of more than 16% and a reduction in mean corpuscular volume (MCV) < 80 fl, in the presence of

populations of microcytic and hypochromic erythrocytes.[13,14,12] The third stage (iron deficiency anemia itself) is characterized by a reduction in iron delivery to the bone marrow, reducing both haemoglobin synthesis and content in erythrocyte precursor cells. The damage inflicted on the body increases as the concentration of available iron diminishes.[13,12]

According to Ayurveda we can explain the pathophysiology of Pandu roga is as: Due to excessive intake of amla (sour), lavana (salt), kshara (alkali), virudha (opposite) food, Madya sevana (alcohol intake) Pitta aggravates. The powerful Vata displace the Pitta present in hridaya, spreading it to all parts of body. Then it brings about vitiation of Shleshma, Tvaka, Rakta & Mansa dhatu and getting localised in between Tvaka & Mansa produce different Varna in skin such as pandu, harita & haridra out of which pandutva is most prominent.

Diagnostic approach

To diagnose iron deficiency anemia, a full blood count must be performed and serum ferritin levels must be measured.[7,10,15,16] When iron is deficient, the body initially turns to its iron stores, consequently depleting them. It is at this stage that ferritin levels fall; however, there are no functional abnormalities at this point. Next, serum iron levels decrease, transferrin saturation diminishes and iron-binding capacity increases; however, anemia is not yet present. It is only when the negative iron ba - lance persists that anemia develops or manifests itself.[12,17] Diagnosis is based on three different aspects: a com- plete history of the patient, focusing on possible signs and symptoms; a detailed physical examination, also taking the patient's sexual maturation into considera- tion; and laboratory tests.

Table 1.1: Haemoglobin levels to diagnose anaemia (g/dl)

Age group	No Anaemia	Mild	Moderate	Severe
Children 6–59 months of age	≥11	10–10.9	7–9.9	<7
Children 5–11 years of age	≥11.5	11–11.4	8–10.9	<8
Children 12–14 years of age	≥12	11–11.9	8–10.9	<8
Non-pregnant women (15 years of age and above)	≥12	11–11.9	8–10.9	<8
Pregnant women	≥11	10–10.9	7–9.9	<7
Men	≥13	11–12.9	8–10.9	<8

Source: Haemoglobin concentration for the diagnosis of anaemia and assessment of severity. WHO

Symptoms

In the majority of cases, the onset of anemia is insidious, with symptoms appearing gradually. The principal symptoms are Panduta (pallor), Shrama (fatigue), Shwasa (dyspnoea on

exertion), Hridaya drava (palpitations), Daurbalya (physical debility), Aruchi (anorexia), Gaurava (heaviness), Pindikodvestana (swollen limbs with pain), Annadvesha (changes in appetite), Hataprabha (attention disorders) and poor school performance.[18] Less common symptoms associated with anemia include: major haemorrhage resulting from a range of different diseases or injuries that may lead to a state of shock and acute anaemia. Adolescence is a period of profound physical and psychological changes before adult life begins. Therefore, pediatricians should be attentive to a variety of physical, behavioral and social-related facets, in addi- tion to the pathologies that tend to be characteristic of this period of life.[17]

Daily Iron requirement: Recommended Daily Allowances of Iron (mg/100g)

Group	Age	Iron (mg/day)
Boys	10-12yrs	21
Girls	10-12yrs	27
Boys	13-15yrs	32
Girls	13-15yrs	27
Boys	16-17yrs	28
Girls	16-17yrs	26

- **(Revised RDA for Indians 2010)**

Prevention of both iron deficiency and anaemia require approaches that address all the potential causative factors. Interventions to prevent and correct iron deficiency and IDA therefore must include measures to increase iron intake through food based approaches, namely dietary diversification and food fortification with iron; iron supplementation and by improved health services and sanitation.

Food based approaches

Food-based approaches to increase iron intake through food fortification and dietary diversification are important sustainable strategies for preventing iron deficiency and IDA in the general population. However, it is not easy to change food habits or ensure access to iron rich foods since diets in SEAR countries are primarily cereal based and bioavailability of iron from such diets is limited. On the other hand, iron from dietary animal source (heme iron) is better in terms of bioavailability but consumption is rather low or nil due to social reasons and poverty.

Management

- Education is fundamental tool to iron deficiency anemia. Dietary iron intake can be increased in poor communities.

- Proper natural diet be ensured including grains pulses, green leafy vegetables, other which are rich in iron and folic acid and meat products rich in bio available iron,
- Consumption of foods rich in vitamin C such as Oranges, Guava, Amla, Lemon etc. need to be encouraged to promote iron absorption.
- Control of parasitic worms and malaria should be taken care.

Diet during adolescents (10-19 years)

Remembering that the iron requirements of the adolescent increase during the pubertal growth spurt64. Peak growth occurs during Tanner stage 4 when there is extensive formation of muscle mass. The increased needs of this period can be met it increased amounts of foods listed in the daily guide are included in the diet. Boys may need to consume a lot of energy rich foods, in order to provide sufficient energy. Girls may need to pay special attention to foods rich in protein, iron and other nutrients necessary for synthesis and regeneration of red blood cells. The girls diet should include all foods listed in the food guide, with special attention to iron rich foods such as Legumes, Leafy green vegetables, dried fruits and egg, liver and red meats may also be used if acceptable.[19]

It is important for adolescents to gain appropriate weight for their height and body build. Any deviation from normal indicates some feeding problem, which must be identified and corrected with the help of nutritionist or dietician. The nutritional status of adolescents is important and should be evaluated according to their body mass index (BMI) and sexual maturation index65 to enable timely identification of any nutritional disorders. Nutritional status should be evaluated systematically.

Prevention

Prevention of iron deficiency anemia should be based on four approaches.

1. Nutritional counseling aimed at improving the quality of the diet. Breastfeeding should be en- couraged; 2. Iron supplementation therapy; 3. Fortification of food; 4. Infection control.

Providing dietary counseling is fundamental and it is important to explain that the bioavailability of iron ob- tained from meat (red or white meat) is greater. In addi- tion to meat, individuals should be encouraged to con- sume citric fruits, vegetables and legumes and be warned to avoid sodas, tea, coffee, excessive amounts of milk, and cereals that reduce iron absorption.[17]

Mode of action of drugs (Sesamum seed, Jaggery & Glycine soja)

Sesamum seed

Botanical name of Tila is Sesamum indicum Linn. its synonym is Sesamum orientale Linn. belongs to family Pedaliaceae is an erect, glandular-pubescent, annual herb up to 95 cm tall, branching from the base. Leaves alternate or lower opposite and often deeply 3 lobed; lobes lanceolate, 3-15 x 1.5-6 cm, serrate, flowers ill smelling, white or pink with yellow marks. Fruits quadrangular, oblong, compressed capsules, deeply 4-grooved, dehiscent to half way down. Seeds many, obovoid, compressed, black or white in color.[20]

Jaggery

Jaggery (Guda) is prepared from Ikshu rasa. Its botanical name is Saccharum officinarum Linn. belongs to family poaceae is a perennial tall herb stems up to 6 m. high, many-noded, glabrous or pubescent below the panicle, more or less coated with wax below the nodes. Leaf-sheaths tight, terete, smooth, glabrous except when goung; ligules very short, membranous, ciliate; blandes linear-lanceolate, up to 1.5 m. long and over 5cm. broad, green above, glaucous below, more or less scribied along the margins, midrib very stout, rounded on the back, more or less flat above.[21]

Soyabean

An annual with stout suberect or climbing stems, densely clothed with fine rusty coloured hairs. Leaves 3- foliolate, long petioled; leaflets 5-10 cm long, ovate, usually acute. Pods 2-3 in the axils of the leaves, 3.8-5 cm. long, linear-oblong, recurved, densely pubescent, subtorulose, 3-4 seeded.[22]

The soybean in the U.S., also called the Soya bean in Europe (Glycine Max), is species of legume native to East Asia, widely grown for its edible bean which has numerous uses. Its botanical name is Glycine max and belongs to family Fabaceae. The plant is classed as an oil seed rather than a pulse by the UN Food and Agriculture Organization (FAO). Soybean produce significantly more protein per acre than most other uses of land. It is rich in iron content 11.3 mg per 100 gm.

The seeds (beans) are used medicinally. They contain valuable nutritive substances - proteins (40 per cent), fatty oil (20 per cent), carbohydrates, lecithin (a phospholipid), vitamins and minerals. Soybean is an important constituents of some infant foods for diabetics because its sugars remain largely unabsorbed.[23]

Probable Mode of Action of The Drug.

Pandu roga is apitta predominant disease. Hence the use of Tikta, Kashaya and Madhura rasa are beneficial in reducing the aggravated pitta. The Tikta, Kashaya and Madhura rasa of Tila & Soyabean may be helpful in reducing the aggravated pitta. Madhura vipaka of Guda may also be effective in pacifying the pitta. Jatharagni gives nourishment to the dhatus and strength to other agnis, Tila and Guda both has agnivardhaka property. Dhatus normally get increased by the foods and regimen which are fully similar or which contain properties predominantly similar. In Panduroga there is Raktalpata, which means defective formation of rakta dhatu occurs. From the above principle this decrease in rakta dhatu can be compensated with food regimen or medicines having the similar qualities of rakta dhatu. Rakta is agni predominant. This agneyasma is responsible for the colour of blood. So in Pandu the drug should posses agneya guna. Tila, Soyabean and Guda contains iron which can be considered as agneya.

DISCUSSION & CONCLUSION

Anemia is one of the most important nutritional deficiencies affecting various social and socio economic strata. It is more common in developing countries, with children and adolescents being at a significantly higher risk for the condition. To perform a literature review on iron deficiency anemia in adolescence as a public health issue and on the risk factors that may contribute towards nutritional deficiencies, stunted growth and development in this age group, emphasizing the physiopathology and causes of anemia, the different diagnostic approaches, and its clinical characteristics, prevention and treatment. The studies reviewed revealed a prevalence of iron deficiency anemia of around 20% in adolescents and described the harmful effects of anemia in this age group. Preventive action is required with respect to iron deficiency anemia. Healthcare professionals should be aware of the need for early diagnosis, prophylaxis and treatment. So we need to give the supplement food rich in iron content for this Tila, Guda and Soyabean have plenty of iron and enriched with nutritive value. So it seems very rationale to use these supplements in treating pandu i.e. anemia.

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