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ANAEMIA A SHORT REVIEW: AN APPROACH TO ADOLESCENT GIRLS

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Abstract

World Health Organisation defines adolescence as the segment of life between the ages of 10 to 19 years. 240 million of Indian adolescents are girls. Adolescence is a crucial period when major physical, psychological, and behavioral changes take place. Anaemia in any condition is characterised by an abnormal decrease in total red blood cell mass resulting, reduction in concentration of hemoglobin of blood loss among girls. It can result in development and cognitive function impairment, loss of productivity, and increase the susceptibility. A common presenting symptom includes weakness, fatigue, dizziness, syncope, chest pain and palpitations. To treat anaemia, focus should be placed on foods that are good sources of iron, copper, zinc, folic acid, vitamin B-12 and protein. School based nutrition education has potential to improve dietary practices that affect young persons health, growth, and intellectual development. Especially for girls and women it is essential to educate because, girls are future mothers. To strengthen any nation there is need of healthy mothers. Only healthy mothers can produce healthy citizen.

Key words: Adolescent girls, anaemia, iron, nutrition education, healthy mother.

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Adolescent definition

The term "adolescence" is derived from the Latin word "AD- OLESCERE" meaning "TO GROW" or "TO MATURE". Adolescence is one window of opportunity which can be used effectively to inculcate good practices in individuals and hence in community [12].

World Health Organization has defined 'adolescence' as a period between 10 and 19 years. Adolescence in girls has been recognized a special period of transition from girlhood to womanhood. Adolescent girls constitute one fifth of the female population in the world [19]. Adolescence is a transitional period between childhood and adulthood [8]. The world is home to 1.2 billion individuals aged 10–19 years [35]. 240 million (20%) of the world's adolescents live in India and 115 million (48%) of Indian adolescents are girls. There is global consensus that investing in adolescents, particularly girls, can accelerate the fight against deprivation, inequity and gender discrimination [2].

Adolescence is a crucial period when major physical, psychological, and behavioral changes take place. This group constitutes about 22% of the Indian population [7]. "Adolescence" is a dynamically evolving theoretical construct informed through physiologic, psychosocial, temporal and cultural lenses. This critical developmental period is conventionally understood as the years between the onset of puberty and the establishment of social independence. The most commonly used chronologic definition of adolescence includes the ages of 10-18, but may incorporate a span of 9 to 26 years depending on the source [11].

Growth and Development of Adolescent

Growth is the increase in the body size and mass as a result of the increase in the number and size of cells. Development is the differentiation and maturation of biological functions of organs. Growth is a dynamic process and continues until the end of adolescence. Growth and development are affected by genetic and environmental (nutrition, living conditions, geographical conditions, socio-economic conditions, etc.) factors [22]. Throughout adolescence the teenage body and brain proceeds in development toward full adult stature and complete sexual maturation. Although there is an increasing acceptance of the pubertal physique, concern over making the body more attractive escalates. Significant brain development continues including progressive frontal lobe development, cerebral myelination and synaptic pruning, and neurotransmitter stabilization [11].

With the onset of the symptoms of puberty, a significant acceleration is observed in increase in length as a result of anabolic effect of gonadal hormones. Testosterone has a stronger anabolic effect compared to Estrogen group of hormones. Therefore, the peak height velocity (PHV) is more significant in boys. There is not a significant difference between boys and girls in terms of muscle strength before puberty. In puberty, the increase in muscle mass and strength in boys is higher compared to girls due to the effect of androgen hormone. The increase in strength continues until late puberty. In the process of puberty, a rapid progress in bone age is observed,

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followed by the joining of pineal bodies. Estrogens play the major role in the progress of bone age and closing of pineal bodies. When the bone age reaches 15 in girls and 16 in boys and the growth rate is determined to be less than 1cm in the last year, the individual is accepted to have reached adult height. 'Self-definition and personality development' occur during the psychosocial development. Age-specific tasks and behaviors that reflect adult roles are observed in self-definition [22].

Anaemia definition

Anaemia is the most common nutritional disorder worldwide [31]. It is defined as a reduction in the red blood cell volume or hemoglobin concentration below the normal range of values occurring in the healthy population with respect to age and sex [27]. It is alternately defined as a reduced absolute number of circulating RBCs or a condition in which the number of RBCs (and subsequently their oxygen-carrying capacity) is insufficient to meet physiologic needs [10]. It is a medical condition in which the hemoglobin (Hb) concentration and red blood cells (RBCs) count are lower than the normal range [13].

Anemia is not a disease but a condition in which the hemoglobin content of blood is lower than normal as a result of deficiency of one or more essential nutrients particularly iron, which is essential for the formation of haemoglobin. Anemia in any condition is characterized by an abnormal decrease in total blood red blood cell mass resulting, reduction in concentration of hemoglobin of blood on red blood cells mass. The lower haemoglobin level and insufficient number of red blood cells due to lack of iron reduces the oxygen carrying capacity to various tissue, impairs brain development, physical work capacity and regulation of body temperature [4]. It is defined as hemoglobin below two standard deviations of the mean for the age and gender of the patient. Iron is an essential component of the hemoglobin molecule [36]. Anemia is a condition in which the number of red blood cells and consequently their oxygen-carrying capacity is insufficient to meet all the body's physiologic needs which are vary with a person's age, gender, altitude, smoking and different stages of pregnancy [23].

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Levels of anaemia

Table 1: Classification of anaemia based on Hb % level with various standards.

Grades of anaemia	UNICEF (gm/dl)	WHO (gm/dl)	IAP (gm/dl)	Nelson"s (Essential Pediatric, 2002) (gm/dl)	Jain A K (Anatomy and physiology for nurses, 2004) (gm/dl)	Ghai A C (Applied physiology, 2000) Above (gm/dl)
Normal	Above 12	12 and above 12	Above 14	12 and above 12	Above 12	Above 10
Mild	10.0-11.99	10-11.9	10-14	10-12	8-12	8-10
Moderate	8.0-9.99	7-9.9	6-10	8-10	5-8	7-8
Severe	Below	Below 7	Below 6	Below 8	Below 5	Below 7

WHO has classified anemia into three categories: mild (11.0 - 11.9 g/dl), moderate (8.0 - 10.9 g/dl) and severe (< 8 g/dl) anemia. UNICEF classified anemia to be mild in children, adolescent girls and pregnant women if the Hb level in blood is between 8.0 and 10.99 g/dl among children, 10.0 to 11.99 g/dl among adolescent girls and 8.0 - 10.99 g/dl Hb level among pregnant women. For severely anemic the Hb level should be below 5.0 g/dl among children, 8.0 g/dl among adolescent girls and 5.0 g/dl among pregnant women. Accordingly moderate anemia is denoted when the Hb level is between mild and severe anemia [4].

Classification of anaemia

Anemia can be classified from three points of view: pathogenesis, red cell morphology, and clinical presentation. All are important to guide the diagnosis. Pathogenic mechanisms involved in the production of anemia are very simple: inadequate production and loss of erythrocytes a result of bleeding or hemolysis. Based on these pathogenic mechanisms, anemia can be divided into two types. (1) Hypo-regenerative: when bone marrow production is decrease as a result of impaired function, decreased number of precursor cells, reduced bone marrow infiltration, or lack of nutrients; (2) Regenerative: when bone marrow responds appropriately to a low erythrocyte mass by increasing production of erythrocytes. In practice, classification based on basic parameters of red cell morphology such as mean corpuscular volume (MCV), allows for a quicker diagnostic approach. Anemia also can be classified according to the form of clinical presentation as acute (usually bleeding or hemolysis) or chronic.

Anemia can be classified as microcytic, normocytic or macrocytic, depending on MCV. As stated above, it can be hypo-regenerative or regenerative, which depends on the number of reticulocytes. Using both, the list of possible diagnoses in the individual patient is reduced [5].

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Stages of anaemia

According to Herbert the deviations from normal iron status to the anemic stage has been categorized in four stages. In stage I due to reduced iron absorption, moderate depletion of iron stores starts and in II stage there will be negative iron balance as severe depletion of iron stores starts. Though iron stores are low in these stages dysfunction does not occur. If intervention starts during these stages, dysfunction may be avoided. In negative iron balance, Iron deficiency during Stage III anemia is not accompanied by dysfunction; however, in stage IV negative iron balance is characterized by inadequate body iron, causing dysfunction as well as anemia [4].

Causes of anaemia

The main causes of anemia are a decrease in RBCs, insufficient Hb synthesis or increased RBCs destruction, and the primary cause is an iron deficiency [13]. Iron deficiency anaemia is a major nutritional problem in India and other countries. The incidence of anaemia is the highest among women especially adolescent girls varying between 60% to 70% [20]. The common causes of iron deficiency are incorrect dietary habits, infections, infestations and menstrual blood loss among girls. Anemia among school children can be prevented by deworming, iron supplementation, and proper diet [26].

Iron deficiency is thought to be the most common cause of anemia globally, but some other nutritional deficiencies (including folate, vitamin B12 and vitamin A), acute and chronic inflammation, parasitic infections, and inherited or acquired disorders can cause anemia [24]. Adolescent girls are at risk of iron deficiency and anaemia due to various factors including high requirements for iron, poor dietary intake of iron, high rates of infection and worm infestation, as well as pregnancy [14]. It may result from insufficient iron intake, decreased absorption, or blood loss. Iron-deficient anemia is most often from blood loss, especially in older patients. It may also be seen with low dietary intake, increased systemic requirements for iron such as in pregnancy, and decreased iron absorption such as in celiac disease [36]. Menstrual abnormalities and inadequate diet are two major cause of anemia among adolescent girls. It can result in development and cognitive function impairment, loss of productivity, and increase the susceptibility to infection, that would widely affect the economic burden [25].

Nutritional anemias result when concentrations of hematopoietic nutrients those involved in RBC production or maintenance are insufficient to meet those demands. Causes of nutrient deficiency include inadequate dietary intake, increased nutrient losses (e.g., blood loss from parasites, hemorrhage associated with childbirth, or heavy menstrual losses), impaired absorption (e.g., lack of intrinsic factor to aid vitamin B12 absorption, high intake of phytate, or Helicobacter pylori infection that impair iron absorption), or altered nutrient metabolism (e.g., Vitamin A or riboflavin deficiency affecting mobilization of iron stores) [10]. A major cause of anaemia is contamination of drinking water with fluoride. It leaches out minerals in the earth's crust and contaminates underground aquifers [33].

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Regardless of the various aetiologies, most anaemic patients usually have some component of iron deficiency, which responds to iron administration. With the elderly, the aetiology is attributed to iron deficiency in approximately one-third and chronic renal disease or inflammation accounts to another one-third. The aetiology in the remaining group is often unclear [3].

Factors associated with anaemia

Factors such as nutrition deficiency with iron, infections like hookworm, schistosomiasis and malaria and hemoglobinopathy due to sickle cell disorder and thalessemia accelerates anemia. However anemia due to iron deficiency continues to remain the commonest cause of anemia. It is due to iron deficiency expedites adverse outcomes such as maternal and infant mortality, Intra Uterine Growth Restriction (IUGR) and heart failure [18]. In addition, the negative consequences of IDA on cognitive performance leading to a deficit of five to ten points in intelligence quotient (IQ). It also affects physical development, language skills, motor skills and coordination among infant and young children and physical development of children. It also impact the immune system and increases the chances of infections and inflammatory disease, leading to fatigue, weakness, lethargy, shortness of breath, Pain, discomfort, anxiety, depression and decreased concentration. All these contribute to reduced work capacity and overall performance in adults, bringing serious economic consequences and obstacles to national development [4].

Sociodemographic factors and practices during menstrual period need to be studied in adolescent girls and a way to reduce anemia not only by supplementation of iron and folic acid tablets and deworming but ensuring its regular consumption [17].

Signs and Symptoms of anaemia

Symptoms and signs of chronic anemia are mostly due to decreased tissue oxygenation from the reduction of the oxygen-carrying capacity of the blood. Symptoms are worse when anemia is severe, with a rapid decrease in hemoglobin and hematocrit and with increased oxygen demands states like exercise. Common presenting symptoms includes Weakness, fatigue, dizziness, syncope, Exertional dyspnea (exercise intolerance) chest pain and palpitations anorexia cognitive impairment [6]. Psychological problems like depression, confusion, difficulty with memory or even dementia and Nervous problems like numbness, pins and needles, vision changes and unsteadiness. can develop. Prolonged or severe vitamin B12 deficiency may therefore cause permanent brain or nerve damage [32].

Diagnosis and Management of anaemia

Chronic anemia is managed predominantly in outpatient settings. They need hospitalization if

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- A significant drop in hemoglobin/HCT
- Transfusion needed
- Extensive investigations needed

If hemoglobin is less than 7 g/dL or if a patent is symptomatic, transfusion of packed red blood cells (PRBC) is indicated.

Transfusions should be done with caution in patients with volume overload status like end-stage renal disease (on hemodialysis) and Congestive Heart Failure (CHF).

Other treatments include treating underlying conditions as below.

- Iron deficiency anemia: Intravenous (IV) iron versus oral iron
- Vitamin B12 and folic acid deficiency with B12 and folic acid supplementation
- Treating underlying bone marrow disorders
- EPO injections in chronic kidney disease patients
- Synthroid in patients with hypothyroidism
- Avoiding any culprit medications
- Treatment of GI causes of blood loss (PPI for gastritis and PUD)
- Regulation of menstrual cycles in patients with menorrhagia [6]

Increasing dietary iron consumption alone is insufficient to treat IDA and higher supplemental doses of iron are essential. However, increasing the iron intake and enhancing the absorption by minimising the inhibitors and maximising the enhancers may be valuable for secondary prevention of iron deficiency. Parenteral treatment may be used in patients who cannot absorb or tolerate oral iron, such as those who have undergone gastrectomy, bariatric surgery, gastrojejunostomy, or other small bowel surgeries [3].

‘Drinking orange juice when you take iron tablets can help with the absorption of iron,’ Ms Benton said. ‘Caffeinated drinks, drinks, such as (caffeinated fizzy drinks), tea or coffee can actually inhibit the absorption of iron, and therefore stops the medication working effectively [9].

The treatment of iron-deficient anemia includes treating the underlying cause, such as gastrointestinal bleeding, and oral iron supplementation. Iron supplementation should be taken without food to increase absorption. Low gastric pH facilitates iron absorption. A rapid response to treatment is often seen in 14 days. It is manifested by the rise in hemoglobin level. Iron supplementation is needed for at least three months to replenish tissue iron stores and should proceed for at least a month even after hemoglobin has returned to normal levels [36]. Treating anemia is a matter of how much food we eat that aid in hemoglobin synthesis. In general, to treat anemia, focus should be placed on foods that are good sources of iron, copper, zinc, folic acid, Vitamin B-12 and protein. The combination of iron and B-vitamins is especially good for treating anemia [32].

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Where to conflict anaemia

To combat anemia in adolescents, Government of India has decided to implement the Weekly Iron and Folic Acid (IFA) Supplementation (WIFS) Programme under NRHM in 2013 in class VI to XII enrolled in government/ municipal schools through the platform of schools and out of school through Anganwadi Centers across all states in India. This method of weekly IFA supplementation through school teachers at school level proved effective as a strategy [29].

The intervention strategies mainly involved provision of micronutrient supplementation such as calcium and zinc, in addition to the routine iron folic acid supplementation to adolescent mothers or engaging them in nutritional education sessions to enable them to improve nutritional intake [28]. Especially for girls and women it is essential to educate this population because, today girls are future mothers. To strengthen any nation there is need of healthy mothers. Only healthy mothers can produce healthy citizens [30].

The beneficial interactions of deworming and vitamin A supplementation could have widespread implications for current preventive public health interventions [21]. [34] Shows in her study that the factors such as age, literacy status of mother, type of family, community, weight, diet, frequency of intake of green leafy vegetables and fruits, menstrual discharge, and deworming are the factors contributing to the prevalence of anemia.

[16] Studied that nutritional education includes gaining of knowledge and behaviour changes regarding food consumption and nutrition-related practices. He also explains that study conducted in India reported that nutrition education intervention was essential for female adolescents to create awareness of and to disseminate knowledge related to the control and prevention of anaemia.

Conclusion

There is a need to include iron rich food for both boys and girls, because they are the future pillars of our Nation. WIFS is also supposed to reach out-of-school boys and girls in the age group of 10–19 years through the platform of Anganwadi centers (located in every village). According to WIFS programme, IFA tablet containing 100 mg elemental iron and 500 mg folic acid will be supplemented for 52 weeks in a year [26].

The National Nutritional Anaemia Prophylaxis Programme (NNAPP) was initiated nationwide in 1970 as a measure to prevent anaemia in the country [1]. Still there are so many children, adolescents, pregnant women and lactating mothers are unaware about the seriousness of anaemia and the schemes launched and provided by the Government. This should be entirely changed by providing alertness and frequent meetings by the experts.

School based nutrition education has potential to improve dietary practices that affect young persons' health, growth, and intellectual development [15]. Anything which is new can be

taken to the school children and adolescents. This is the right platform to introduce and to spread knowledge to the family members and to the illiterates. Through this they all become responsible to the community based problems and they create a bond to trounce the deficiency disorder or disease or community based problems. Only awareness, knowledge and executive influence will not be the solution to eradicate anaemia, applying this in day to day life will help in recuperating.

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