Tackling Iron Deficiency Anemia – Indian Perspective

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ABSTRACT

Iron deficiency anemia is not only a threat to the health and well being of a society, but also to the economic growth and development of a nation. The grounds that this predicament is so widespread are that iron is one of the very crucial nutrients with a substantial role in multiple metabolic systems of the human body. The absolute challenge in iron prophylaxis lies in the fact that the slightest overdose can prove fatal due to its toxic effects. Not only does India lead in being the first country to instigate the National Nutritional Anemia Prophylaxis Programme, it also leads the top countries in being affected by nutritional anemia per se. The problem of iron deficiency anemia needs a multi dimentional approach. Generating nutritional awareness in an easy and base method for addressing this problem. This method however requires thorough inputs of time, effort and sincere manipulation to give its results. It need not be mentioned that this method leaves us with a 100 per cent absence of side effects or contra indications as compared to any prophylaxis or supplementation. The most needed saying to be kept in mind is 'prevention is better than cure'.

Keywords: *Anemia, deficiency, haemoglobin, health, iron, micronutrient, prevalence, nutritional status*

1. INTRODUCTION

Iron deficiency anemia is a contemporary topic for countless years in view of the fact that it is the most widely rampant issue sparing no nation or community. The grounds that this predicament is so widespread are that iron is one of the very crucial nutrients with a substantial role in multiple metabolic systems of the human body. Iron in the form of heme is vital to many metabolic functions including oxygen transportation in hemoglobin. Iron is also a component of multiple enzymes, including cytochromes, necessary for energy generation and drug metabolism (Crichton, 2009). More than poor dietary intake, poor absorption seems to be the major culprit for the scenario. Though the human body has evolved to conserve iron in several ways, including the recycling of iron after the breakdown of red cells and the retention of iron in the absence of an excretion mechanism, since excess levels of iron can be toxic, its absorption is limited to 1 to 2 mg daily (Camaschella, 2015). The absolute challenge in iron prophylaxis lies in the fact that the slightest overdose can prove fatal due to its toxic effects. Not only does India lead in being the first country to instigate the National Nutritional Anemia Prophylaxis Programme, it also leads the top countries in being affected by nutritional anemia *per se*. It must therefore be high time that we investigate the reasons behind this age old failure story and prevent history from repeating itself.

Anaemia is defined as a decrease in the concentration of circulating red blood cells or haemoglobin concentration and a concomitant impaired capacity to transport oxygen. McLean (2008) has proposed that

anaemia has multiple precipitating factors that can occur in isolation but more frequently co-occur. These factors may also be genetic, such as haemoglobinopathies. Many of these risk factors for anaemia co-exist in communities and affect individuals in composite ways not adequately understood (De Benoist *et al*., 2008) and this complexity presents a challenge to effectively address the population determinants of anaemia (Balarajan, 2011).

2. THE NUMBERS

Iron deficiency is the most common single-nutrient deficiency in the world. Iron deficiency, which affects over half the world's population, is the most common preventable nutritional deficiency and, together with vitamin A and zinc deficiencies, has the largest documented disease burden among micronutrients (WHO 2009). In many low and middle income countries, the prevalence of iron deficiency anaemia among children under five years of age is at least 25 per cent, and is often higher (Black et al., 2011). It is a major underlying cause of death among children and pregnant women in the developing world, and because it is most prevalent in the poorest communities, it represents a useful marker of social and economic marginalization (Noor, 2011). According to Pettit et al (2011) iron deficiency remains one of the world's greatest public health problems and the greatest contributor to anaemia, globally affecting 47 per cent of preschool children and 25 per cent of school age children. Balarajan (2011) has reported that anaemia affects one quarter of the global population, including 293 million children younger than five years and 468 million non-pregnant women.

As stated by Black et al (2008), iron deficiency anaemia during pregnancy is associated with 115,000 women's deaths each year, which account for one fifth of total maternal deaths. It is further estimated by UNICEF (2008) to cause almost 600,000 stillbirths or deaths of babies within their first week of life.

Iron deficiency anaemia (IDA) occurs in 2–5% of adult men and postmenopausal women in the developed world (Goddard et al., 2011). Reports depict a pathetic more than half of the world's undernourished population to be living in India (Ganz, 2003). In some global regions, the prevalence of anemia among young children is >50% and even approaches 100% in some locales (Lutter 2008) and among those 40%–50% of the population remains anemic at all ages with the exception of nonelderly men (McLean et al. 2009). The 2005-2006 National Family Health Survey (NFHS-3) (Arnold et al., 2009) has identified 70% children aged 6–59 months, 55% in females aged 15–49 years, and 24% in males aged 15–49 years Indians with evident anemia. According to National Nutrition Monitoring Bureau Survey (NNMBS) 2006, the prevalence of anaemia in Indian adolescent girls (12-14 years) is 68.6% whereas in (15-17 years) it is 69.7% (NNMB, 2006). The Indian government has set its goal at reducing the load of anaemia among girls and women by 50% in its 12th five year plan. However, it is a silent truth that every health plan has a start with a goal of reduction in the burden and an end with a failure in fulfilling it with reference to the colossal giant named anemia.

3. PATHOGENESIS

Iron-deficiency anemia is a severe condition of depleted iron stores in which low levels of iron lead to anemia along with the presence of microcytic hypochromic red cells. Iron deficiency anemia may be classified into 3 stages: storage iron deficiency, iron deficient erythropoiesis, and iron deficiency anemia (Crichton, 2009). In developing countries, low iron bioavailability of the diet is the primary cause of iron deficiency anemia

however, in developed countries, decreased iron absorption and blood loss account for the more likely etiologies of iron deficiency (Wimbley and Graham, 2011).

Daily dietary iron requirements are about 8 mg for adult men and 18 mg for adult women with menstrual iron losses (Trumbo et al., 2001). Both iron deficiency and iron excess cause cellular and organ dysfunction. Low plasma iron concentrations (hypoferremia) restrict iron uptake by erythrocyte precursors, limiting hemoglobin synthesis and causing anemia (Ganz and Nemeth, 2012). A drop in iron absorption can occur due to a range of physiological stress conditions as gastritis, mal absorption, chronic internal haemorrhage, therapeutic drug therapy and in postoperative states.

The chief location of metabolic iron in the human body is the haemoglobin, the oxygen-transport metalloprotein of the erythrocytes. These erythrocytes, along with their precursors require huge amounts of iron for haemoglobin synthesis. Each ml of erythrocytes contains about 1 mg of iron, which is about 2–3 g of iron in total The total life span of human erythrocytes being 120 days, approximately 20 ml of senescent erythrocytes are cleared daily, and the 20 mg of iron in those cells is effectively recycled for the production of new erythrocytes. Owing to a shorter half-life of circulating erythrocytes in iron deficiency anemia, the amount of iron in each microcytic erythrocyte is reduced (Macdougall et al. 1970). If iron losses continue, the newly produced erythrocytes will have decreased hemoglobin, causing the amount of iron provided by the same number of senescent erythrocytes to be reduced (Miller, 2013).

The term ‘nutritional anaemia’ encompasses all pathological conditions in which the blood hemoglobin concentration drops to an abnormally low level. In public health terms, iron deficiency is by far the first cause of nutritional anaemia worldwide (Kotecha, 2011). The main nutrients involved in the synthesis of hemoglobin are iron, folic acid, and vitamin B12. Physiologically, iron deficiency occurs when the body's requirements for iron exceeds the amount of iron absorbed from the diet (Berger et al., 2011). Anaemia is the result of a wide variety of causes that can be isolated, but more often coexist. It is generally assumed that 50 per cent of the cases of anaemia are due to iron deficiency, but the proportion may vary among population groups and in different areas according to the local conditions. The main risk factors for iron deficiency anaemia include a low intake of iron, poor absorption of iron from diets rich in phytate or phenolic compounds, and stage of life when iron requirements are high. Among the other causes of anaemia, heavy blood loss as a result of menstruation, or parasite infections can lower blood haemoglobin concentrations. Acute and chronic infections, including malaria, cancer, tuberculosis, and HIV can also lower blood haemoglobin concentrations. The presence of other micronutrient deficiencies, including vitamins A and B12, folate, riboflavin, and copper can increase the risk of anaemia. Furthermore, the impact of haemoglobinopathies on anaemia prevalence needs to be considered within some populations (WHO, 2009).

4. EFFECTS

There is no age group that cannot escape the risk of iron deficiency and none of these can escape its adverse consequences if left unchecked. Presumably, the importance given to iron deficiency as a public health problem itself is based ultimately on the massiveness and irreversibility of the consequences it has on one’s health. This one micro nutrient with macro functionalities has been most extensively studied for its effects consequences of

iron deficiency involve work performance and immune function. It is further associated with a threatening list of irregularities including non-hematological disturbances, compromised growth and development, reduced physical work capacity, decreases the cognitive function, lowered indurations, poor scholastic performances, complicated pregnancies, elevated risk of birth defects, neurological disturbances, prematurity and growth retardation. Illness is another cause which impedes the body's ability to absorb and retain vitamins and minerals. Vitamin and mineral nutrition is severely compromised by parasitic infections such as hookworm. A vicious cycle ensues when the deficiencies caused by disease leave the individual more vulnerable to further illness, and less able to combat it when affected.

5. INEFFECTIVE PREVENTIVE MEASURES

Right from improvement in the dietary intakes, supplementation, fortification, prophylaxis have all been identified as proven measures to combat iron deficiency anemia. The most extensive approach for the management of iron deficiency anemia has been through oral pills which incorporate iron either in its ferrous or ferric forms. Improvements along with adverse effects and challenges have also been evident with measures like oral iron therapy (Short and Domagalski, 2013) parenteral iron therapy (Grey and Finlayson, 2008), red cell transfusion (Pasricha et al., 2010). Iron tablets have the risk of inducing a high concentration of free radicals in the intestinal milieu, which may damage the intestinal epithelium (Lund et al., 1999). It is an apparent realism that the manifest measures with a promise in combating iron deficiency anemia has an equal challenge that questions its effectiveness when the massive numbers of the afflicted population are considered. The efforts in overcoming micronutrient deficiencies in nutritionally-vulnerable groups and low-income food-deficit countries continue to be thwarted by challenges such as technical and managerial capacity constraints, the need for systematic compliance with procurement specifications and quality control, clearer policies on micronutrient content labeling, and the need for cash resources to support many aspects associated with local processing and fortification activities (WFP, 2006).

6. NUTRITION AWARENESS

The prevention and successful treatment for iron deficiency anemia remains woefully insufficient worldwide, especially among underprivileged women and children (Miller, 2013). The magnitude of anemia as health problem is huge and can be tackled with increasing awareness, promotion of correct attitudes and practices. (Singh, Sing and Kaur, 2015) Iron supplements are freely available over the counter, and the general public has easy access to them whereas their utilization pattern is primarily influenced by an individual's knowledge (Naeem et al., 2016). Studies have projected significant positive correlations between higher flesh food intake and biomarkers of iron status suggest that educating non-vegetarians about the benefits of increased flesh food consumption and vegetarians about dietary iron enhancers and inhibitors may have potential for addressing the high rates of iron deficiency among young women (Leonard et al., 2014).

7. CONCLUSION

The problem of iron deficiency anemia needs a multi faceted approach. However, the most cheap, reliable and effective method of its management remains the oldest one- nutrition awareness generation. This method

however requires thorough inputs of time, effort and sincere manipulation to give its results. It need not be mentioned that this method leaves us with a 100 per cent absence of side effects or contra indications as compared to any prophylaxis or supplementation. The most needed saying to be kept in mind is 'prevention is better than cure'.

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