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## A critical review on iron deficiency anaemia in female population of developing India

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### Abstract

Anaemia is a condition characterized by a reduction in the total circulating haemoglobin. There are different types of anaemia, which are classified according to the causes of the anaemia: a default in the production of red blood cells may be attributable to an iron, vitamin B12 or folate deficiency. Excessive destruction of red blood cells because of chronic diseases of nutritional, infective, metabolic or genetic origin leads to anaemia. Iron deficiency anaemia (IDA) is the commonest type of anaemia.

Among women, IDA is common during childbearing years and particularly during pregnancy due to increased demand of iron and folic acid. This leads to maternal and infant morbidity and mortality. IDA causes pallor, weakness and tiredness. This disorder has a negative impact on immune status and physical work capacity. It can impair cognitive performance in all individuals. The main risk factors of IDA are: inadequate iron intake (due to an iron-deficient diet or inadequate absorption), increased iron requirements, and blood loss. Indeed, the daily diet must include sufficient amounts of high bio available iron. This review will focus on recent advances in our understanding of the burden of anemia in female population and the causes and consequences of anemia among women.

**Keywords:** Iron, Female, Haemoglobin, Anemia WHO etc

### Introduction

Historically (1500 B C), in Ayurvedic literature, Charak samhita described fatigue and pallor caused by "bloodlessness", which can be cured by Lauha bhasma (calcified iron). During the same period, the Egyptian manual of therapeutics 'Ebers Papyrus' described a disease characterized by pallor, dyspnea and oedema. In Greek literature (1554 – 1700) "Chlorosis/Demeorbo Virgineo" or green sickness was described as curable by drinking iron rust dissolved in water or wine. (Agarwal K N)

In India, in 1968, Dr Gopalan constituted an Expert Committee of the Nutrition Society of India, to suggest measures to control anaemia in the country. The Committee, on the basis of the available data on prevalence and severity of anaemia from Delhi, Calcutta, Madras and Vellore, recommended the setting up of a National Nutritional Anaemia Prophylaxis Programme (NNAPP) for pregnant women as they were at higher risk of developing anaemia, possibly severe anaemia. The effort was a national commitment to prevent and control anaemia. Unfortunately, apathy towards the programme and disinterest in controlling iron deficiency made it a difficult journey to prevent nutritional anaemia and iron deficiency in the country (Agarwal K N.)

Iron deficiency anaemia is the state where in iron content of the body is below normal, low transferring saturation & ferritin as well as high iron binding capacity. As per WHO iron deficiency anaemia affects 1.3 billion people worldwide amongst which 43% are preschool children, 51% are pregnant women and 37% are school age children (WHO, 2001) [36]. Recent estimates of iron deficiency anaemia show that 52% of Indian women aged 15–49 years are anaemic (WHO, 2001) [36]. National Family Health Survey (NFHS)-3, show prevalence of anaemia in 56.2 per cent of women of 15-49 yr, 79.2 per cent amongst children aged 6-35 months, 57.9 per cent in pregnant women and 24.3 per cent in men aged 15-49 yr. Women are vulnerable part of society due to poor intake & absorption, increased requirements, menstrual loss & adolescent pregnancies.

Iron deficiency anaemia is the most common form of malnutrition in the world and is the eighth leading cause of disease in girls and women in developing countries (World development report investing in health, 1993). Its estimated prevalence in South-East Asia is 50% to 70% (Garcia & Mason, 1992) [39]. Correction of Iron deficiency (Latent anaemia) &

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Iron Deficiency anaemia (IDA) have become critical goals all over the world because of their negative consequences like decreased immunity, increased morbidity and impaired cognitive performance. On comparing IDA and scholastic achievements in young adolescents in Philadelphia, the score of anaemic subjects was significantly lower than those of non-anaemic subjects (Webb & Oski, 1974) [37]. It is important to ensure that satisfactory iron status be maintained in young females before they go for pregnancy to prevent premature births, low birth weights and perinatal mortality (Bothwell & Mallett, 1955; Godfrey & Redman; Scholl & Hediger, 1922) [38]. IDA through its effects on cognition and educational achievements among young students impairs work performance, endurance, productivity and ultimately economic prosperity. The combination of high prevalence rates and inadequate preventive programmes highlight the need for new effective sustainable strategies to control IDA.

### Indian Scenario

Prevalence of anaemia in all the groups is higher in India as compared to other developing countries. In India, anaemia affects an estimated 50% of the population. The problem becomes more severe as more women are affected with it as compared to men. It is estimated that about 20%-40% of maternal deaths in India are due to anaemia and one in every two Indian women (56%) suffers from some form of anaemia. According to National consultation on control of nutritional anaemia in India, anaemia is defined as the hemoglobin of less than 12 g/dl in females. Mild anemia is defined as hemoglobin level of 10-11.9 g/dl, moderate anemia as haemoglobin level of 7-9.9 g/dl and severe anemia was defined as hemoglobin level of less than 7g/dl among females. Data from National Nutrition Monitoring Bureau (NNMB) 2002, Indian Council of Medical Research (ICMR) 2004 and District Level Household Survey (DLHS) 2006 surveys have shown that prevalence of anaemia is very high (ranging between 80->90%) in preschool children, pregnant and lactating women and adolescent girls. Low birth weight infants, young children and women of childbearing age are particularly at risk of anaemia. That way Anaemia begins in

childhood, worsens during adolescence in girls and gets aggravated during pregnancy. In India, adolescent girls, who constitute a sizable segment of its population form a vulnerable group 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 for the development of nutritional anaemia. 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.

India has among the highest number of cases of anaemia in the world, according to the NFHS-III undertaken in 2005-2006. The reasons range from high cost of healthcare facilities, poor food quality and the low status of women. The survey further revealed that among the states, Assam is the worst affected with 72% of married women being anaemic, followed by Haryana (69.7%) and Jharkhand (68.4%). The prevalence of malaria in states like Assam was cited as one of the chief reasons for this sorry state of affairs. Anaemia remains to be major cause of maternal mortality and low birth weight in India. Moderate and severe anaemia is seen even among educated families and the higher income group. Pregnant women with Hb less than 8 g/dl constitute a high risk group. Seven states, Himachal Pradesh and Haryana in the North; Tamil Nadu and Kerala in the South; Assam and Orissa in the East and Madhya Pradesh in Central India were investigated. A total of 84 per cent pregnant and 92.2 per cent lactating women were anaemic with severe anaemia in 9.2 and 7.3 per cent respectively; 39.2 and 27.3 per cent in Madhya Pradesh, 14.4 and 8.6 per cent in Assam and 8.5 and 13.4 per cent in Haryana had severe anaemia in pregnancy and lactation, respectively. ICMR data in the same districts also reported 90.1 per cent adolescent girls with anaemia (7.3% having severe anaemia). ICMR district nutrition survey (1999-2000) reported prevalence of anaemia as 84.2 per cent with 13.1 per cent with severe anaemia in pregnancy. So, these findings suggest continuation of anaemia throughout life in women.

**Table 1.** Anaemia Among Young Girls and Women In Different Populations Of India (Kawaljit Kaur 2014)

Place	Total No	Age Group	Normal	Anaemic	Mild	Moderate	Severe	Investigator
Rural women of North India	136	6-70		50(88)	30.1(41)	19.1(26)	0.7(1)	Mahajan <i>et al.</i> , 2004
SC Girls (Amritsar)	265	11-15	78	70.57(187)	30.57(81)	27.17(72)	12.83(34)	Sidhu <i>et al.</i> , 2005
Urban area, Nagpur	296	10-19	192	35.1(104)	69.2 (72)	30.8 (32)	-	Chaudhary and Dhage, 2008
Jat Haryana	R=300 U=300	40-70	R=26 U=42	88.7 [R=91.3(274) U=86(258)]	-	-	-	Kaur and Kochar, 2009
Kolkata	19,695 NFHS-3	-	-	65.6	47.9	16.1	1.6	Ghosh, 2009
Rural Girls, Patiala	50	16-18	1	98	18 (9)	56 (28)	14 (7)	Kaur and Kaur, 2011
Anganwari centre, rural Karnataka	314	10-19	172	45.2(142)	40.1(126)	54.92(172)	4.92(16)	Siddharam <i>et al.</i> , 2011
Rural area in Dakshina, Kannada Dist. of Karnataka	155	15-45)	-	34.82(54)	-	-	-	Raghuram <i>et al.</i> , 2012

### Maharashtra scenario

The rural population, who is the prime victims of the policies, work in the most hazardous atmosphere and live in abysmal

living conditions. Unsafe and unhygienic birth practices, unclean water, poor nutrition, subhuman habitats, and degraded and unsanitary environments are challenges to the

public health system. The majority of the rural population are smallholders, artisans and labourers, with limited resources that they spend chiefly on food and necessities such as clothing and shelter. They have no money left to spend on health. The rural peasant worker, who strives hard under adverse weather conditions to produce food for others, is often the first victim of epidemics. This present paper attempts to review critically the current health status of India, with a special reference to the vast rural population of the beginning of the twenty first century.

Rekha Dutt *et al.* shows that the problem of iron deficiency in these girls with prevalence of 61% should be considered serious and action should be taken without delay. Bhise, R.M *et al* (2013) <sup>[9]</sup>, indicated that the prevalence of anemia was 77.1% (239/310) in the school children of tribal ashram schools, Ahmednagar. Arlappa N *et al* (2014) <sup>[12]</sup> concluded that anaemia is a severe public health problem among pre-school children and women of different physiological groups in rural Maharashtra. Ahmad N, *et al* (2010) <sup>[10]</sup> Very high prevalence of anaemia (74.84%) early in pregnancy is an indicator of the failure of national and WHO programmes to address this problem.

Sarika More, Sumeet Shende (2013) <sup>[11]</sup> concluded that Iron deficiency is the major cause of anemia and most common nutritional disorder in our country and remains a formidable health challenge. Females in the period of later school age and early adolescence are prone to develop iron deficiency (79%) because, the nutrient requirements are high as the reserves are being laid for the subsequent rapid pubertal growth spurt, menstrual loss and also due to limited dietary iron intake in rural area of wardha district of Maharashtra. Pushpa O Lokare *et al* (2012) <sup>[13]</sup> shows Overall prevalence of anemia among the pregnant women was found to be 87.21% among pregnant women in Aurangabad city of Maharashtra.

### Discussion

Anaemia is a multi-factorial disorder that requires a multi-pronged approach for its prevention and treatment. Prevalence of anemia in various region in India and Maharashtra state by different authors is shown above indicate that the failure of national and WHO programmes to address this problem. In India till date very few studies have been done to know the prevalence of iron deficiency using serum ferritin or/and transferrin saturation criteria.

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 improved health services and sanitation. Special emphasis should be given for nutrient supplement especially iron and vitamins in all age group as there are chances of iron deficiency. Firm policies should be developed for vitamin and mineral supplementation in adolescents with political commitment. Prevention and control of anaemia requires a coordinated response among multiple stakeholders and partners.

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