



## Anemia: A Common Health Problem, Consequence and Diet Management among Young Children and Pregnant Women

*Dr. Rakesh Kumar*

*Assistant Professor, Department of Biotechnology and Microbiology,  
Abhilashi Institute of Life Science, Tanda, Ner-Chowk, Mandi, (HP) India*

*(Corresponding author Dr. Rakesh Kumar)*

*(Received 05 January, 2014, Accepted 01 February, 2014)*

**ABSTRACT:** India is among the countries with highest prevalence of anaemia in the world and accounts for the largest number of anaemic persons in the world. It is estimated that about 20%-40% of maternal deaths in India are due to anaemia; India contributes to about 50% of global maternal deaths due to anaemia. This review aimed to see prevalence of anemia, mainly iron deficiency anemia (IDA), diet management mainly for young children and pregnant women. One in four people is affected by anaemia, and pregnant women and pre school-age children are at the greatest risk.

Adverse effects of anemia are seen in pregnant women and their offsprings mostly in developing countries where anemia is more prevalent. Health education and preventive measure during pregnancy are crucial factors for both mother and their offspring's health because each pregnant woman is at risk during pregnancy. A clear strategy is needed to create awareness among the people who are at high risk.

**Key word:** Anemia, diet in anemia, folic acid, Vitamin B12

### INTRODUCTION

Anemia, a major public health problem and one of the most common nutritional disorders worldwide has major consequences for human health, economic and social development (Dorothy *et al.*, 2007; WHO, 2002). According to World Health Organization (WHO),

anemia, has been defined by the as “a condition in which the number of red blood cells (RBCs) or their oxygen-carrying capacity is inadequate to meet physiologic demands of the body, which vary by sex, age, altitude, smoking, and pregnancy status” (WHO, 2010).

### Grading of Anemia

Grade	Scale (Hemoglobin level in gm/dl )
1 (Mild)	10-lower limits of normal Hemoglobin
2 (Moderate)	8-10
3 (Severe)	<8
4 (Life threatening)	Life threatening
5 (Death)	Death

**Note:** Normal Hemoglobin levels

Adult male : 13-18 gm/dl

Adult women : 12-16gm/dl

**Source:** Common Terminology Criteria for Adverse Events (CTCAE),  
[www.anemia.com](http://www.anemia.com), A source for anemia education

A number of studies conducted in India of micronutrient deficiency confirm high prevalence of anemia; (Sharma *et al.*, 1996; Kanani and Poojara, 2000; Chakma *et al.*, 2000; Rajaratnam *et al.*, 2000; Kapil *et al.*, 1999). It may happen at any stage of life; but young children and women in the reproductive age group are the most prone to anemia due to iron, folic acid and vitamin B12 deficiency (Dorothy *et al.*, 2007). In many developing countries, anaemia during pregnancy is a major clinical health problem (Jerdén, 2010). Most of the anemia is due to deficiency of essential nutrients which maintain haemoglobin level, like iron, folic acid and vitamin B12, proteins, amino acids, vitamins A, C, and other vitamins of B-complex group vitamins *i.e.*, niacin and pantothenic acid (Dorothy *et al.*, 2007). For adolescent children, anemia is a significant public health problem which cause harmful effect on physical growth, morbidity, cognition, and reproduction (Seshadri, 1997).

Dietary factors play an important role in the development of iron deficiency. Although most of the people residing in different regions of India consume diets which contain adequate amounts of iron (26 mg) the iron absorption from such diets is only 1-5% (25 Years of National Nutrition Monitoring Bureau, 1995; Rao, 1978). Further suggestion comes from The Institute of Medicine that the RDA for folic acid and vitamin B<sub>12</sub> is 400 and 2.4 µgm B12, respectively (Institute of Medicine, 1999). Since folic acid and vitamin B12 both are very essential for proper functioning of the human body. Folic acid is essential for normal red blood cell formation, and vitamin B12 is essential for the conversion of methyl THF to folic acid (Guyton and Hall, 1996 and Murray *et al.*, 1996). Since the deficiency of vitamin B12 it leads to the deficiency of folic acid also leading to anemia (Hoffer *et al.*, 2006).

Folic acid and vitamin B12 deficiency also impairs DNA synthesis and results in impaired and ineffective erythropoiesis (Fishman *et al.*, 2000). Folic acid deficiency also observed with iron deficiency, among adolescents in Venezuela with prevalence 80.0% to 90.0% (García-Casal *et al.*, 2005; Suárez *et al.*, 2005). Prevalence of folic acid deficiency varies from one country to another. Studies in rural area of Bangladesh have revealed iron deficiency in 25.0% adolescent girls. (Ahmed *et al.*, 2013).

Iron deficiency anemia is the most common contributor to the onset of anemia which is responsible for about half of anemia cases (WHO, 2001). Similar study in Kazakhstan, also revealed that Iron deficiency anemia (IDA) is the most common nutritional disorder across the world (Izmukhambetov, 1990; Morse, 1994; Preliminary report of a survey on anaemia, 1994;

National Institute of Nutrition, 1996; Sharmano, 1998; Dangour *et al.*, 2001; Dangour *et al.*, 2002; Hashizume, 2003; Hashizume, 2004; Hashizume, 2005).

The most common symptoms of anemic women are weakness, fatigue, breathlessness, palour and palpitations. In severe conditions, it is associated with fainting, dizziness and some times even heart attack, and the patient may experience circulation disturbances (WHO, 2010; E-Medicine Health, 2010).

### Prevalence of Anemia

According to National Family Health Survey, Indian children suffer from weight loss, stunted growth and wasting, which is higher than any other country in the world, and 7 out of every 10 young children are anemic. (National Family Health Survey, 2005-06).

More than half of women (55 percent) and almost one-quarter of men (24 percent) are anemic, out of these thirty-nine percent of women have mild anemia, 15 percent have moderate anemia, and 2 percent have severe anemia. And in men, 13 percent have mild anemia, 10 percent have moderate anemia, and 1 percent have severe anemia.

In India, anemia affects an estimated 50 percent of the population (Florentino, 2003). Study in different parts of the country revealed highest prevalence of anemia in women (more than 60 percent) from Jharkhand, Bihar and the Northeast states. Anemia among children is widespread throughout India but prevalence of anemia varies from 38 percent in Goa to 78 percent in Bihar. Similar pattern was seen in NFHS 2 study that total of 84 percent pregnant and 92.2 percent lactating women were anemic with severe anemia in 9.2 and 7.3 per cent respectively; 39.2 and 27.3 percent in Madhya Pradesh, 14.4 and 8.6 percent in Assam and 8.5 and 13.4 percent in Haryana had severe anemia in pregnancy and lactation, respectively (NFHS, 2000).

More than half of young children in 24 states have anemia, including 11 states where more than two-thirds of children are anemic. Seven percent of children in Rajasthan and Punjab are severely anemic, more than twice the level in India as a whole. Almost half of children in Uttar Pradesh, Bihar, Chhattisgarh, Andhra Pradesh, Madhya Pradesh, Rajasthan, and Haryana are moderately or severely anemic. The lowest levels of anemia are in five states that are widely scattered throughout the country (Punjab, Manipur, Mizoram, Goa, and Kerala). Even in these states, however, more than 30 percent of women are anemic.

In Himachal Pradesh severe anemia has not been observed as compared to 0.7 and 1 per cent in pregnant and lactating women in NFHS study (NFHS, 2002).

### **Anemia, women and pregnancy**

Anemia is one of the most common diseases complicating antenatal women worldwide, particularly in the developing countries (Ministry of Palestinian Health, 2006). Anemia is more common during pregnancy; hence pregnant women are at higher risk than non-pregnant women (March of dimes, 2010). A similar study also has been revealed that the prevalence of anemia among pregnant women in developing countries accounts for about 56% while in the developed world about 16% are anemic, and for non-pregnant women, its 43% in the developing countries and 12% in the developed world (WHO, 1992).

Hemoglobin level less than 11g/dl in pregnancy, will be considered as anemic, according to WHO criteria (Candio *et al.*, 2010).

In pregnant women the iron demand is increased, due to the physiological increase in red blood cell mass, and also for the development and growth of the placenta and fetus

(Arkutu, 1979). Women need additional iron from puberty stage to menopause. These requirements increase with physiological changes and due to excessive blood loss during menstruation. That's why iron deficiency is most common among women of reproductive age in both developing and developed countries (Katai *et al.*, 1996; Milman *et al.*, 1993).

As it is known that the fetus depends on the mother blood, so the lack of iron in women blood during pregnancy may affect the fetal growth and development and may lead to preterm birth and low birth weight, resulting in an increase in perinatal death (Health system, 2010).

Due to this fact anemia leads to increased risk of premature delivery and low birth weights. If iron deficiency present in late pregnancy that results in poor foetal iron stores which is also very harmful (Agarwal, 1983; Agarwal, 1984).

There are two main causes of anemia during pregnancy, iron deficiency, which is the commonest cause of anemia during pregnancy. The second cause is genetic disorders such as, thalassemia or sickle cell anemia. (March of dimes, 2010). For Iron deficiency anemia (IDA), women may use iron pills during pregnancy, but overdose of iron pills or overuse of iron pills, affect stomach or colon and this will lead to a number of side effects such as nausea, vomiting, abdominal discomfort and constipation (Leong, 2009).

### **Diet management in Anemia**

Anemia could be an indicator of both poor health and poor nutrition status. Harmful effect of tea and coffee on iron absorption also found in study done by Anderson, (1996) which indicated that tea can cause iron absorption to drop by 60% and coffee by 50%. One previous study also has shown that there is a substance called tannin, present in tea which has a negative effect on iron absorption, particularly non-haem iron (Disler, 1975).

Iron absorption can be improved by taking diet which contain fruits and vegetables which are rich sources of Vitamin C such as citrus fruit mainly *Emblica* (amla) or berries, peppers, broccoli, cabbage, tomatoes, kiwi, mangoes and papayas etc (Smart diet for teens).

Treatment of anemic women, and availability of food rich in iron (wheat flour with iron and folic acid), milk sugar and salt with iron to build long term iron stores remains the key to reduce anemia. Cooking in iron vessels also improves iron content in the diet (Kapur *et al.*, 2002).

### **Health education during pregnancy**

Geographic pattern of anemia for men is generally similar to the pattern for women.

Most effective step to reduce the prevalence of anemia during pregnancy is health education. Most educated state Kerala is an example for our anemia awareness programme where lowest prevalence of anemia for both women and men is present (Essen, 2001; Hoffman, 1998). Health education constitutes awareness about anemia in terms of exposures, risk factors, essential nutrition ingredients and the importance of iron supplementations (Hoffman, 1998). Generally, awareness refers to "The state of feeling or the ability to perceive, or to be conscious of events, sensory patterns or object" or can be defined more broadly and simply as "the state of being aware of something" (Wikipedia). Many women lack knowledge or are not aware about their medical condition or the risk factors which can be life threatening. In general, for this type of awareness, women play an important role in the family by act as main health providers (WHO, 1997). So it is necessary for all women to take safety measures and more precautions, in order to avoid the occurrence of anemia before, during and after pregnancy.

As a consequence women are expected to have their hemoglobin measured for anemia regularly during pregnancy particularly in the last three months of pregnancy (March of dimes, 2010; Renkert and Nutbeam, 2001). For that reason, the reduction and control prevalence of anemia among women remains prioritized public health problem particularly in women of childbearing age worldwide (WHO, 1992).

So it is important to make all women, specially women in the reproductive age, aware through effective and well organized health education programs and campaigns, with focus on major health problems that might occur during pregnancy in particular anemia. (Bredmar, 1999).

In many countries the pregnant women have access to some necessary health information during pregnancy and birth but these little knowledge about anemia is not very much useful. However, the quality of information varies among women. One of the problems that may lower the level of awareness in pregnancy is that the health care providers do not have feedback especially as to what extent the women understand the information they receive (Bredmar, 1999). Therefore, for the success and effectiveness of health education, it is better that the information is provided to women in groups, where they feel more comfortable, satisfied and interact to benefit from each other (Ingram, 2003).

## CONCLUSION

Despite the fact that anemia has been identified as global public health problem for several years, no rapid progresses has been observed and the prevalence of the disease still high globally. The WHO and the United Nations International Children Fund (UNICEF) have stated that there is an immediate need to reduce the prevalence of anemia, and the importance of identifying its numerous aetiology, in order to ascertain effective control and preventive programmes (WHO, 2004).

The interstate differences observed may guide the health planner to alter the strategies for control of anemia in poor performing States (Agarwal *et al.*, 2006). An effective strategy is needed to make the health education sessions for pregnant women and young children. It is important to raise the level of awareness by all possible ways with the help of Media, TV, and health campaigns by Government as well as

Non Government Organization at community basis, so it can reach to door step of each family specially women in reproductive age.

It is also important that by the help of National Social Services (NSS) unit this awareness programme be conducted in all educational institutions.

It is of great importance to encourage and motivate all women, especially multiparous women and the less educated women, for early registration for their health check up and antenatal visits to clinics to attend health education sessions.

## REFERENCES

- World Health Organization Report (2002). The annual Report of World Health Organization: Reducing risks, promoting healthy life. Geneva, WHO.
- World Health Organization. Anaemia. WHO (2010).
- Sharmanov A: Anaemia in Central Asia: DHS Experience. Food and Nutrition Bulletin (1998). **19**: 307-317.
- Kanani, S.J. and Poojara, R.H. (2000). Supplementation with iron and folic acid enhances growth in adolescent Indian girls. *J. Nutr.* **130**: 452S – 455S.
- Chakma, T., Rao, P.V. and, Tiwary, R.S (2000). Prevalence of anemia and worm infestation in tribal areas of Madhya Pradesh. *J. Indian Med. Assoc.* **98**: 567 – 561.
- Rajaratnam, J., Abel, R., Asokan, J.S. and Jonathan, P. (2000). Prevalence of anemia among adolescent girls of rural Tamil Nadu. *Indian Pediat.* **27**: 532 – 536.
- Kapil, U., Pathak, P., Tandon, M., Singh, C., Pradhanb, R. and Dwivedi, S.N. (1999). Micronutrient deficiency disorders amongst pregnant women in three urban slum communities of Delhi. *Indian Pediat.* **36**, 983 – 989.
- S. Seshadri, (1997). "Nutritional anaemia in South Asia," in *Malnutrition in South Asia: A Regional Profile*, S. K. Gillespie, Ed., pp.75–124, UNICEF Regional Office for South Asia.
- 25 Years of National Nutrition Monitoring Bureau. (1995). National Institute of Nutrition (Indian Council of Medical Research), Hyderabad. p12.
- Narasinga Rao (1978). B.S. Studies on iron deficiency anaemia. *Indian J. Med. Res.*, **58**: 58.

- Institute of Medicine (1999). Dietary reference intakes for thiamin, riboflavin, niacin, vitamin B6, folate, vitamin B12, pantothenic acid, biotin, and choline, Washington, DC.
- Guyton, A.C. and Hall, J.E. (1996). Textbook of Medical Physiology, 9th ed.: 845-7 PA: W.B. Saunders, Co. Philadelphia.
- Hoffer, Abram and Prousky, Jonathan (2006). Naturopathic Nutrition, A Guide to Nutrient-Rich Food & Nutritional Supplements for Optimum Health, CCNM Press.
- Murray, R.K., Granner, D.K., Mayes, P.A. and Rodwell, V.W (1996). Harper's Biochemistry, 24th ed. Appleton & Lange.
- S.M. Fishman, P. Christian, and J. West K.P., (2000) "The role of vitamins in the prevention and control anaemia," *Public Health Nutrition*, vol. 3, no. 2, pp. 125–150.
- García-Casal MN, Osorio C, Landaeta M, Leets I, Matus P, Fazzino F., Marcos E. (2005). "High prevalence of folic acid and vitamin B12 deficiencies in infants, children, adolescents and pregnant women in Venezuela," *European Journal of Clinical Nutrition*, vol. 59, no.9, pp.1064-1070.
- T. Suarez, M. Torrealba, N. Villegas, C. Osorio, and M. N. García-Casal, (2005). "Iron, folic acid and vitamin B12 deficiencies related to anemia in adolescents from a region with a high incidence of congenital malformations in Venezuela," *Archivos latinoamericanos de nutrición*, vol. 55, no. 2, pp. 118–123.
- F. Ahmed, M.R. Khan, C.P. Banu, M.R. Qazi, and M. Akhtaruzzaman, (2008). "The coexistence of other micronutrient deficiencies in anaemic adolescent schoolgirls in rural Bangladesh," *European Journal of Clinical Nutrition*, vol. 62, no. 3, pp. 365–372.
- World Health Organization Report (2001). Iron deficiency anaemia: assessment, prevention, and control. A guide for program managers. Geneva: World Health Organization; (WHO/NHD/01.3).
- Izmukhambetov T (1990). Iron deficiency anaemia and health of the population of Kazakhstan. Iron deficiency anaemia as regional problem in Kazakhstan: Epidemiological and nutritional aspects Alma-Ata, National Institute of Nutrition, 3-9.
- Morse C (1994). A study of the prevalence and causes of anemia, Muynak District, Karakalpakstan, the Republic of Uzbekistan. Impact Food Security and Nutrition Monitoring Project Washington, DC, USAID.
- Preliminary report of a survey on anaemia in the Kzyl Orda region of Kazakhstan (1994) by the London Institute of Tropical Diseases. IMPACT Project Washington, DC, USAID.
- National Institute of Nutrition [Kazakhstan], (1996) Academy of Preventive Medicine [Kazakhstan], Macro International Inc: Kazakhstan Demographic and Health Survey, 1995. National Institute of Nutrition/Macro International Inc Calverton, MD.
- Dangour AD, Hill HL, Ismail SJ: (2001). Haemoglobin status of adult non-pregnant Kazakh women living in Kzyl-Orda region, Kazakhstan. *Eur J. Clin. Nutr.*, 55: 1068-1075.
- Dangour AD, Hill HL, Ismail SJ (2002). Height, weight and haemoglobin status of 6 to 59-month-old Kazakh children living in Kzyl-Orda region, Kazakhstan. *Eur. J. Clin. Nutr.*, 56: 1030-1038.
- Hashizume M, Kunii O, Sasaki S, Shimoda T, Wakai S, Mazhitova Z, Dauletbaev D, Caypil W, Aldiyarova M, Farmer A, Yamashiro Y, Chiba M (2003). Anemia and iron deficiency among schoolchildren in the Aral Sea region, Kazakhstan. *J. Trop. Pediatr.*, 49: 172-177.
- Hashizume M, Shimoda T, Sasaki S, Kunii O, Caypil W, Dauletbaev D, Chiba M (2004). Anaemia in relation to low bioavailability of dietary iron among school-aged children in the Aral Sea region, Kazakhstan. *Int. J. Food Sci. Nutr.*, 55: 37-43.
- Hashizume M, Chiba M, Shinohara A, Iwabuchi S, Sasaki S, Shimoda T, Kunii O, Caypil W, Dauletbaev D, Alnazarova A (2005). Anaemia, iron deficiency and vitamin A status among school-aged children in rural Kazakhstan. *Public Health Nutr.*, 8: 564-571.
- E-Medicine Health (2010), Experts for everyday emergencies. Anaemia symptoms. Available from: [http://www.emedicinehealth.com/anemia/article\\_em.htm](http://www.emedicinehealth.com/anemia/article_em.htm) (access in January 11, 2010).
- National Family Health Survey (NFHS-3) (2005-06), Nutrition in India, Ministry of Health and Family Welfare Government of India,
- Florentino RF (2003). The burden of iron deficiency and anaemia in Asia: Challenges in prevention and control. Nutrition goals for Asia - vision 2020; Proceedings IX Asian Congress of Nutrition; p. 313-8.
- National Family Health Survey-2 NFHS-2* (2000)- *Anemia among women and children*. Mumbai: International Institute for Population Sciences.

- NFHS (2002). India 1998-99 - National Family Health Survey-2 NFHS-2 - Anemia among women and children. Mumbai: International Institute for Population Sciences.
- Ministry of Palestinian Health (2006). Women health: Health Status in Palestine. MOH.
- March of dimes (2010). Pregnancy & Newborn, complication of Anaemia during pregnancy
- World Health Organization Report (1992). The prevalence of anaemia in women: a tabulation of available information. WHO, Geneva.
- Candio. F., Hofmeyr. G.J. (2007). Treatments of iron-deficiency anaemia among pregnant women: RHL commentary. *The WHO Reproductive Health Library*; Geneva: WHO.
- Arkutu AA (1979). Pregnancy and labour amongst primi-gravidae women in Tanzania age group between 15 years and under. *Int. J. Gynecol Obstet*; **16**: 128-31.
- Katai E, Raick Y, Kaplan B, Neri A, Friedman J, Cohen Y, (1996). Community screening to discover iron deficiency among healthy menstruating women in Israel suburbs. *Eur J Obstet Gynecol Reprod Biol*; **67**: 21-5.
- Milman N, Lyhne N, Jorgensen T, Rosdahl N, Graudal N (1993). status of iron among Danish women aged 35-65 years. Relation to menstruation and method of contraception *Aca Obstet Gynecol Scand*; **72**: 601-5.
- University of Virginia (2010). Health system: High risk pregnancy: USA
- Agarwal RMD, Tripathi AM, Agarwal K.N. (1983). Cord blood hemoglobin, iron and serum ferritin status in maternal anemia. *Acta Paediatr Scand*; **74**: 545-8.
- Agarwal K.N. (1984). The effects of maternal iron deficiency on placenta and fetus. In: Jelliffe DB, Jelliffe FEP, editors. *Advances in international maternal child health*. Oxford: Clarendon Press; **4**: 26-35.
- March of dimes (2010). Pregnancy and Newborn Health Education Centre. Anaemia during pregnancy.
- Kristei Leong M.D. (2009). Featured Health and Wellness Contributor.
- J. Anderson (1996). Iron: An essential Nutrient Food and Nutritional series. No. 9.356. Available from: <http://www.ext.colostate.edu/pubs/foodnut/09356>.
- Disler, P.B., Lynch, S.R., Charlton, R.W., (1975). The effect of tea on iron absorption. USA, 16: p 193-200.
- SMART DIET FOR TEENS, A Health Education Project by The Adolescent Health Committee of FOGSI and EmcurePharma.
- Kapur D., Agarwal K.N., Agarwal, D.K. (2002). Nutritional anemia and its control. *Indian J Pediatr*; **69**: 607-16.
- Essen, B. (2001) Perinatal mortality among immigrants from Africa's Horn. The importance of experience and tradition for risk assessment in pregnancy and childbirth. Medical dissertation, Department of Obstetrics and Gynaecology, Malmo University Hospital, Lund University, Malmo. Sweden.
- Hoffman, R., Benz, E.J., Shattil, S.J (1998). Hematology: Basic principles and practice. New York, NY: Churchill Livingstone.: P: 397-427.
- Wikipedia, (access in 5 October 2013). The Free Encyclopedia. Awareness.
- World Health Organization (1997). Communicating family planning in reproductive health. WHO.
- Renkert, S., and Nutbeam, D (2001). Opportunities to improve maternal women health literacy throughout antenatal health education: An exploratory study. *Health Promotion International*.; **16**, p 381-388.
- Bredmar, M (1999). PHD Thesis. To make the unusual normal. Monograph. Tema communication, Linkopings University.
- Ingram, J., Johnson, D., and Hamid, N. (2003). South Asian grandmothers influence on breast feeding in Bristol. *Midwifery Bristol*.; **19**, p 318-327.
- World Health Organization, (2004). United Nations Children Funds Report .Focusing on Anaemia: Towards an integrated approach for effective anaemia control .WHO and UNICEF.
- K.N. Agarwal, D.K. Agarwal, A. Sharma, K. Sharma, K. Prasad, M.C. Kalita, N. Khetarpaul A.C. Kapoor, L. Vijayalekshmi, A.K. Govilla, S.M. Panda & P. Kumari (2006). Prevalence of anaemia in pregnant & lactating women in India, *Indian J Med Res.*, **124**, August, pp 173-184.
- Dr. Lars Jerdén., (2010). Awareness of Anaemia among pregnant women at unrwa clinics in Gaza strip Umeå University, Sweden.