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Iron Deficiency Anemia: a burden for world health

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Anemia is the world's second leading cause of disability and is responsible for about 1 million deaths a year, of which three-quarters occur in Africa and South-east Asia. India is among the countries with highest prevalence of anemia and accounts for the largest number of anemic persons in the world. The magnitude of reduction in the prevalence of anemia during nineties in India is lower than that in neighboring south and south East Asian countries. Strategy to prevent and correct iron deficiency anemia, must include measures to increase iron intake through various approaches, iron supplementation and improved health services and sanitation. We hope that this analysis will help health specialists and policymakers to facilitate formulation of strategies to further reduce anemia burden.

Keywords: Iron deficiency anemia, Hemoglobin, Iron supplementation, Fortification of staple foods, Child and maternal mortality

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Introduction

Anemia has major consequences on human health as well as social and economic development. The world's second leading cause of disability and is responsible for about 1 million deaths a year, of which three-quarters occur in Africa and South-east Asia [1].

Anemia, is 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 [2- 4]. Symptoms result from impaired tissue oxygen delivery and may include weakness, fatigue, concentration difficulty, or poor work productivity [5]. Low hemoglobin concentrations can also be caused by genetic traits, such as sickle-cell anemia and thalassaemia [5, 6] inadequate bioavailability of dietary iron in foods that are low in iron, folate, or vitamin B12 [7- 10] malaria [11,12] schistosomiasis [13] hookworm infection [14] HIV infection [15] and some non-communicable diseases. This review mainly concerns with Iron deficiency anemia (IDA), prevalence and awareness to make effective public health policy specially in low income countries.

Prevalence of Anemia

The WHO Global Database on Anemia for 1993–2005, covering almost half the world's population, estimated that 25 per cent of total population of world is affected from anemia [16]. However the prevalence varies from 9 percent in developed countries to 43% in developing countries [17]. Children and women of reproductive age are most at risk, with global anemia prevalence estimates of 47 per cent in children younger than 5 years, 42 per cent in pregnant women, and 30 per cent in non-pregnant women aged 15–49 years [17]. Africa and Asia account for more than 85 per cent of the absolute anemia burden in high-risk groups and India is the worst hit [17].

Iron deficiency Anemia (IDA)

Iron deficiency Anemia is world health problem and it is burden for half of the world's population, prevalence varies widely by geography, age and sex [2] [18, 19]. The commonest causes of anemia in developing countries, particularly among the most vulnerable groups (pregnant women and preschool age children), are nutritional disorders and infections [20].

In 2004, WHO estimates that IDA resulted in 2,73, 000 deaths: out of which 45% in Southeast Asia, 31% in Africa, 9% in the Eastern Mediterranean, 7% in the Americas, 4% in the Western Pacific, and 3% in Europe, with 97% occurring in low- and middle-income countries [21].

The median annual economic loss because of IDA in 10 developing countries was estimated at $16.78 per capita (in 1994 US dollars), or 4% of gross domestic product [22]. The World Health Organization (WHO) estimates that worldwide, 42% of pregnant women, 30% of non pregnant women (aged 15 to 50 years), 47% of preschool children (aged 0 to 5 years), and 12.7% of men older than 15 years are anemic [16]. More than 1.6 billion people, almost a quarter of the world's population, are anemic. Despite considerable economic and scientific advancement during recent decades, there is a marginal reduction in the global prevalence of anemia [16].

Iron deficiency Anemia in Adolescent Girls and pregnant women

Iron deficiency anemia adversely affects the behavior, cognitive performance and physical growth of infants, preschool and school age children, also affect immune status and morbidity from infections of all age groups; and anemia also leads to decrease in work performance of adolescents and adults of all age groups [20]. In India, girls get married and pregnant even before the growth period is over, thus increase the risk for anemia [23].

Percentage prevalence of anemia among adolescent girls in the age group 15–19 years and in the older age group 20–29 years remains almost stagnant at 55.8 per cent and 56.1 per cent respectively [24]. Iron deficiency anemia, especially when severe, is correlated with increased risk of preterm labor, low birth weight [25] child and maternal mortality [26, 27] infection [28] and heart failure [29].

Maternal and neonatal deaths are a major cause of mortality in developing countries and together cause between 2•5 to 3•4 million deaths worldwide [30-32]. Low hemoglobin concentrations during pregnancy can be associated with an increased risk of maternal and perinatal mortality and low size or weight at birth [33- 36].

Iron deficiency anemia and food habits

Adolescent girls are at a great risk for anemia and malnutrition.

Inadequate nutrition during adolescence stage can have serious consequences throughout the reproductive years of life and beyond [37]. In addition to food-based programmes, iron supplementation, alone or together with folic acid and other micronutrients, can be used especially for high-risk groups (i.e., children, pregnant women, and women of reproductive age) to improve intakes in developing countries where they might be deficient in the diet [38- 40].

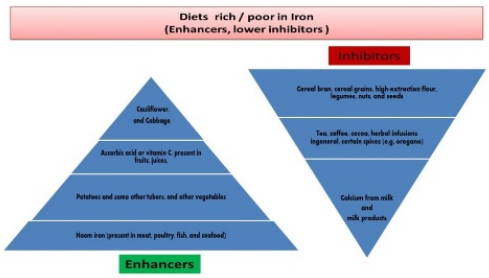

Figure 1: Diet rich/poor in Iron content [20].

Reduction of anemia is very much necessary for women and children health. Despite the modest improvements shown, hemoglobin concentrations remain low and anemia prevalence remains high in the poorest regions of the world, presenting an obstacle to reducing maternal and neonatal mortality and to healthy early childhood development [41].

Further improvements are likely to need a combination of programmes that include iron supplementation, especially during pregnancy. Beyond mortality outcomes, the cognitive benefits of increased hemoglobin will lead to improved school performance and work productivity, and contribute to better health and economic outcomes throughout the life course [36] [42, 43]. Improvements in hemoglobin concentrations in children could have been associated with improvements in overall nutritional and anthropometric status, which has improved in all regions except sub-Saharan Africa [44]. Countries like Laos, Cambodia, and Vietnam started the Intermittent iron and folic acid supplementation programmes, specially for women of reproductive age which might have contributed to improvements in these countries [45- 47]. But iron supplementation during pregnancy in developing countries remains low, because many pregnant women do not attend antenatal clinics or receive sufficient doses of supplement, or because of insufficient emphasis on behavioral aspects of regular supplement use [48].

Nutritional anemia should ideally be addressed through dietary diversification and improved access to foods that have high iron bioavailability, including animal products, fortification of staple foods and condiments can also be used. Wheat flour fortification with folic acid and iron is mandated in more than 70 countries, but the extent of implementation varies [49]. In addition to food-based programmes, daily or intermittent iron supplementation, alone or together with folic acid and other micronutrients, can be used for high-risk groups (i.e., children, pregnant women, and women of childbearing age) to improve intakes in countries where they might be deficient in the diet .

Iron deficiency anemia and Malaria

Iron supplementation in malaria-endemic settings exacerbated malarial disease and even increased mortality in young children [38- 40]. A meta-analysis of supplementation studies has led to a recommendation to integrate iron provision with malaria prevention and treatment [50, 51], which can together have synergistically beneficial effects on hemoglobin status. Preventive interventions, including insecticide-treated bednets and intermittent preventive treatment, also improve hemoglobin concentrations of children and pregnant women living in malaria-endemic areas [11, 12] [42].

Awareness Programme

Awareness about anemia and its consequences for the health and development of women and children has increased in the past few decades. In 2012, the 65th World Health Assembly approved an action plan and global targets for maternal, infant, and child nutrition, with a commitment to halve anemia prevalence in women of reproductive age by 2025, from 2011 levels. As such, attention to nutritional interventions, such as the Scaling Up Nutrition initiative, has increased.

Furthermore emphasis has been placed on the reduction of risk factors that adversely affect women and children, for example in the UN Secretary-General's 'Every Woman Every Child' initiative and the accompanying Global Strategy for the health of women and children [41]. Emphasis has been given to estimate trends in the complete distributions of hemoglobin concentration and anemia prevalence by severity for young children, pregnant and non pregnant women by country and region [41].

There are number of programmes that focus on various issue of anemia include: Integrated child Development Services (ICDS), Mid-day meal programme, Kishori Swasthya Yojna, Matri Suraksha Abhiyan, Indian Medical Association Anemia free India, as a Public-Private Partnership and Anemia Chale Jao etc. [52].

But an effective strategy is yet needed to make the health education sessions for pregnant women and young children.

It is important to raise the awareness by Media, TV, and health campaigns by Government as well as Non Government Organization at community basis, especially for adolescent girls and women in reproductive age [53].

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 [53].

Conclusion

Community plays a significant role in providing health services and information to the people. Social marketing is one of the ways to create awareness of anemia and demand for supply of the health services from the government side [54].

When there is no control policy in places where anemia is prevalent, the priority should be ensuring iron (together with folate) is provided from early pregnancy, it can improve both maternal and infant outcomes and this is safe, cheap, and simple to implement [55].

Providing iron to non pregnant women of reproductive age (WRA), older infants, and young children can then follow, together with medium and longer term strategies. Although distribution of iron has been recommended by international organizations for many years, there has been minimal improvement in the burden of anemia in many low income countries [55].

Anemia control program needs to be implemented more efficiently in low income States. The interstate differences observed may guide the health planner to alter the strategies for control of anemia in poor performing states [56].

Counseling should be done to empower adolescents to make understand the importance of precaution measures to avoid anemia in adulthood.

New innovative and cost effective method needed to developed for the fortification of the food,which is used by common people.

This will help to increase the iron in the food of adolescents for long term in a sustainable manner.

Training program should be organized to make people aware about fortification of food as well as importance of iron for adolescents.

Most of the programs are running on paper not on ground level. Monitoring of these programs should be done properly [54].

Optimized public health systems and partnerships between funders, policy makers, and program managers are needed and to ensure their safe and effective delivery by health workers in the field to the people who are at risk [55]. To start health education sessions with more focus on specific issues and information on anemia, general information, such as the adverse effects of drinking tea with meals in reducing the absorption of iron and about the side effects of misuse or overuse of iron pills especially those women who don't follow a doctor's prescription and health instructions.

To plan for these types of awareness program, information about basic health parameter about iron deficiency anemia in women and children is needed, and how they have changed over time.

The Government needs to provide mass awareness and mass screening of Iron deficiency anemia, and counseling for Iron deficiency anemia among specially school going girls and women of reproductive age.

Reference

01. World Bank. Public health at a glance. December 2004.
cited from: [Article] [Crossref]

02. World Health Organization. Anemia. WHO (2010).
Cited from: [Article] [Crossref]

03. Sachdev H, Gera T, Nestel P. Effect of iron supplementation on mental and motor development in children- systematic review of randomised controlled trials. Public Health Nutr. 2005;8(2)117–132.
[Crossref]

04. Glazer Y, Bilenko N. Effect of iron deficiency and iron deficiency anemia in the first two years of life on cognitive and mental development during childhood. Harefuah. 2010;149(5)309–35. [Crossref]

05. Haas JD, Fairchild MW. Summary and conclusions of the International Conference on Iron Deficiency and Behavioral Development, October 10-12, 1988. Am J Clin Nutr. 1989;50(3)703–705. [Crossref]

06. Weatherall DJ, Clegg JB. Inherited haemoglobin disorders- an increasing global health problem. Bull World Health Organ. 2001;79;704–12. [Crossref]

07. Bhutta Z, Ahmed T, Black RE, et al. What works?- Interventions for maternal and child undernutrition and survival. Lancet. 2008;371;417–40. [Crossref]

08. Pena-Rosas JP, De-Regil LM, Dowswell T, Viteri FE. Intermittent oral iron supplementation during pregnancy. Cochrane Database Syst Rev. 2012;7;CD00-9997. [Crossref]

09. De-Regil LM, Jeff erds MED, Sylvetsky AC, Dowswell T. Intermittent iron supplementation for improving nutrition and development in children under 12 years of age. Cochrane Database Syst Rev. 2011;12;CD009085. [Crossref]

10. De-Regil LM, Suchdev PS, Vist GE, Walleser S, Pena-Rosas JP. Home fortifi cation of foods with multiple micronutrient powders for health and nutrition in children under two years of age. Cochrane Database Syst Rev. 2011;9;CD008959. [Crossref]

11. Korenromp EL, Armstrong-Schellenberg JRM, Williams BG, Nahlen BL, Snow RW. Impact of malaria control on childhood anemia in Africa—a quantitative review. Trop Med Int Health. 2004;9;1050–65. [Crossref]

12. Regan M. The impact of malaria prevention interventions on hemoglobin levels of pregnant women and children in sub-Saharan Africa- a quantitative review. Berkeley- University of California Berkeley. 2011. [Crossref]

13. King CH, Dickman K, Tisch DJ. Reassessment of the cost of chronic helmintic infection- a meta-analysis of disability-related outcomes in endemic schistosomiasis. Lancet. 2005; 365;1561–69. [Crossref]

14. Smith JL, Brooker S. Impact of hookworm infection and deworming on anemia in non-pregnant populations- a systematic review. Trop Med Int Health. 2010;15;776–95. [Crossref]

15. Tolentino K, Friedman JF. An update on anemia in less developed countries. Am J Trop Med Hyg. 2007;77;44–51. [Crossref]

16. Benoist B, McLean E, Egli I, et al. Worldwide Prevalence of Anemia 1993-2005. Geneva, Switzerland- World Health Organization. 2008. [Crossref]

17. McLean E, Cogswell M, Egli I, et al. Worldwide prevalence of anemia. WHO Vitamin and Mineral Nutrition Information System. 1993–2005. [Crossref]

18. World Health Organization /UNICEF/UNU. Iron Deficiency Anemia- Assessment, Prevention, and Control- A Guide for Programme Managers. Geneva, Switzerland- WHO. 2001. [Crossref]

19. Kassebaum NJ, Jasrasaria R, Naghavi M, Wulf SK, Johns N, Lozano R, et al. Oral iron supplements for children in malaria-endemic areas. Cochrane Database Syst Rev. 2011;10;CD006589. [Crossref]

20. Guidelines for Control of Iron Deficiency Anemia. Adolescent Division. Ministry of Health and Family Welfare Government of India. 2013. [Crossref]

21. Mathers C, Steven G, Mascarenhas M. Global Health Risks- Mortality and Burden of Disease Attributable to Selected Major Risks. Geneva, Switzerland- World Health Organization. 2009. [Crossref]

22. Horton S, Ross J. The economics of iron deficiency. Food Policy. 2003;28;51-75. [Crossref]

23. Shobha S, Sharada D. Efficacy of twice weekly iron supplementation in anemic adolescent girls. Indian Paediatr. 2003;40;1186-90. [Crossref]

24. National Nutrition Monitoring Bureau. Diet and Nutritional Status of Rural Population and Prevalence of Hypertension among adults in Rural Areas. NNMB Technical Report No 24, 2006.
[Crossref]

25. Rasmussen KM. Is There a Causal Relationship between Iron Deficiency or Iron-Deficiency Anemia and Weight at Birth, Length of Gestation and Perinatal Mortality?. J Nutr. 2001;131(2)590S–603S.
[Crossref]

26. Brabin BJ, Hakimi M, Pelletier D. An Analysis of Anemia and Pregnancy-Related Maternal Mortality. J Nutr. 2001;131(2)604S–615S.
[Crossref]

27. Brabin BJ, Premji Z, Verhoeff F. An Analysis of Anemia and Child Mortality. J Nutr. 2001;131(2)636S–648S.
[Crossref]

28. Dunne JR, Malone D, Tracy JK, Gannon C, Napolitano LM. Perioperative Anemia- An Independent Risk Factor for Infection, Mortality, and Resource Utilization in Surgery. Journal of Surgical Research. 2002;102(2)237–244.
[Crossref]

29. Anand IS. Anemia and Chronic Heart Failure Implications and Treatment Options. J Am Coll Cardiol. 2008;52(7)501–511.
[Crossref]

30. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010- a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2012;380;2095–128.
[Crossref]

31. UNFPA, UNICEF, WHO, World Bank. Trends in maternal mortality- 1990 to 2010. Geneva- World Health Organization. 2012.
[Crossref]

32. Liu L, Johnson HL, Cousens S, et al. Global, regional, and national causes of child mortality- an updated systematic analysis for 2010 with time trends since 2000. Lancet. 2012; 379;2151–61.
[Crossref]

33. Stoltzfus RJ, Mullany L, Black RE. Iron defi ciency anemia, In- Ezzati M, Lopez AD, Rodgers A, Murray CJL, eds, Comparative quantifi cation of health risks- global and regional burden of disease attributable to selected major risk factors. Geneva- World Health Organization. 2004;163–210.
[Crossref]

34. Kozuki N, Lee AC, Katz J. Moderate to severe, but not mild, maternal anemia is associated with increased risk of small-for-gestational-age outcomes. J Nutr. 2012;142;358–62.
[Crossref]

35. Zhang Q, Ananth CV, Rhoads GG, Li Z. The impact of maternal anemia on perinatal mortality- a population-based, prospective cohort study in China. Ann Epidemiol. 2009;19;793–99.
[Crossref]

36. Steer PJ. Maternal hemoglobin concentration and birth weight. Am J Clin Nutr. 2000;71;1285S–7S.
[Crossref]

37. Nayar PD, Mehta R. Child Health, In- Gupta P, Ghai OP, Editors, Textbook of Preventive and Social Medicine. 2nd ed, New Delhi- CBS Publishers and Distributors. 2007;428-37.
[Crossref]

38. Sazawal S, Black RE, Ramsan M, et al. Effects of routine prophylactic supplementation with iron and folic acid on admission to hospital and mortality in preschool children in a high malaria transmission setting- community-based, randomised, placebo-controlled trial. Lancet. 2006;367;133–43.
[Crossref]

39. Oppenheimer SJ, Gibson FD,Macfarlane SB, et al. Iron supplementation increases prevalence and eff ects of malaria- report on clinical studies in Papua New Guinea. Trans R Soc Trop Med Hyg. 1986;80;603–12.
[Crossref]

40. Smith AW, Hendrickse RG, Harrison C, Hayes RJ, Greenwood BM. The effects on malaria of treatment of iron-deficiency anemia with oral iron in Gambian children. Ann Trop Paediatr. 1989;9;17–23.
[Crossref]

41. Gretchen A Stevens, Mariel M Finucane, Luz Maria De-Regil, Christopher J Paciorek, Seth R Flaxman, Francesco Branca, et al. On behalf of Nutrition Impact Model Study Group (Anemia), Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anemia in children and pregnant and non-pregnant women for 1995–2011- a systematic analysis of population-representative data. Lancet Glob Health. 2013;1;e16–25.
[Crossref]

42. Balarajan Y, Ramakrishnan U, Ozaltin E, Shankar AH, Subramanian SV. Anemia in low-income and middle-income countries. Lancet. 2011;378;2123–35.
[Crossref]

43. Thomas D, Frankenberg E, Friedman J, et al. Causal eff ect of health on labor market outcomes- experimental evidence. Los Angeles, CA- University of California. 2006.
[Crossref]

44. Stevens GA, Finucane MM, Paciorek CJ, et al. Trends in mild, moderate, and severe stunting and underweight, and progress towards MDG 1 in 141 developing countries- a systematic analysis of population representative data. Lancet. 2012;380;824–34.
[Crossref]

45. Klemm RD, Sommerfelt AE, Boyo A, et al. Are we making progress on reducing anemia in women?. Washington DC- AED, 2011.
[Crossref]

46. WHO. Weekly iron and folic acid supplementation programmes for women of reproductive age. Manila- World Health Organization. 2011.
[Crossref]

47. WHO. Prevention of iron deficiency anemia in adolescents- role of weekly iron and folic acid supplementation. New Delhi- World Health Organization. 2011.
[Crossref]

48. Lutter CK, Daelmans BMEG, De Onis M, et al. Undernutrition, poor feeding practices, and low coverage of key nutrition interventions. Pediatrics. 2011;128;e1418–27.
[Crossref]

49. Flour Fortifi cation Initiative. Global Progress. 2012.
[Crossref]

50. WHO. Guideline- use of multiple micronutrient powders for home fortifi cation of foods consumed by infants and children 6–23 months of age. Geneva- World Health Organization. 2011.
[Crossref]

51. World Health Organization. Guideline-intermittent iron supplementation in preschool and school-age children. Geneva- World Health Organization. 2011.
[Crossref]

52. 12 by 12 Initiative programme - Government of India. World Health Organization, United Nation. India Children Education Fund& Federation of Obstetric and Gynecological Societies of India.
[Crossref]

53. Kumar R. Anemia- A Common Health Problem, Consequence and Diet Management among Young Children and Pregnant Women. Biological Forum– An International Journal. 2014;6(1)24-29.
[Crossref]

54. Ramesh V, Kharb M, Yadav SP, Chaudhary V, Ruchi, Ajay. Prevelence of anemia amoung adolescents under IBSY in rural block of Disst Of northeren India. IJSSIR. 2013;2(9)95-106.
[Crossref]

55. Pasricha S, Drakesmith H, Black J, Hipgrave D, Biggs B. Control of iron deficiency anemia in low- and middle-income countries. Blood. April 4;2013;121(14)2607-2617.
[Crossref]

56. Agarwal KN, Agarwal DK, Sharma A, Sharma K, Prasad K, Kalita MC, et al. Prevalence of anaemia in pregnant & lactating women in India. Indian J Med Res. 2006 Aug;124(2)173-84.
[Crossref]