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REVIEW OF PROGRESS TOWARDS ANEMIA MUKT BHARAT

Reasons for staggered reduction in Anemia – A review

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Abstract **-** Anemia is a condition in which the number and size of red blood cells, or the hemoglobin concentration, falls below an established cut-off value, consequently impairing the capacity of the blood to transport oxygen around the body. Anemia is an indicator of both poor nutrition and poor health. ***Aim-*** The aim of this review is to track the progress made in reducing anemia at national level across lifecycle. ***Methods and Material***- To review the progress towards Anemia Mukt Bharat, relevant available literature was searched using keywords like "anaemia " or "anemia" or "anemic" or "anaemic" or "hemoglobin" or "iron deficiency" or "iron" or "NIPI" or 'Pandu Roga" and other similar keywords were searched in search engines like Google chrome, Bing and Yahoo. Also the literature available on Anemia Mukt Bharat dashboard was reviewed. ***Result***-India accounts for the highest burden of anemia globally. In the last fifty years, despite substantial programmatic efforts, progress has been slow throughout the lifecycle. ***Conclusion***- From this review we can conclude that though, India has had programs to address anaemia for decades now. These programs have been only partially successful. The Anaemia Mukt Bharat, however, offers a new impetus to strengthen, focus and amplify work to address anaemia. For an accelerated reduction in anaemia, effective convergence of several governmental departments like health, education, water supply and sanitation is needed.

Index Terms **–** Anemia Mukt Bharat, iron deficiency anemia, intensified national iron plus initiative.

INTRODUCTION

Anemia is a medical condition in which a person's red blood cell (or, more precisely, hemoglobin) level is less than normal, as per the WHO cut-offs for hemoglobin as given in Table 1.

Anemia is a global public health issue faced by people in both low- and high-income countries, and is a particular concern for children, adolescent girls and women of reproductive age. There are many forms of anemia, with different causes and treatment. The most common causes of anemia include nutritional deficiencies, due to inadequate (or insufficient) intake of minerals (particularly iron) and vitamins from the diet (Global Nutrition Report, 2020). "Nutritional anemias" result when the intake of certain nutrients is insufficient to cover the demands for synthesis of hemoglobin and erythrocytes. Iron deficiency is the most common nutritional deficiency leading to anemia. Nutritional anemia is a serious public health problem (WHO, 2017). Although anemia is widespread in the country, it especially affects women in the reproductive age group and young children. It is estimated that over 50 percent of pregnant women are anemic (MoHFW, 1991). Anemia is a serious concern for children because it can impair cognitive development, stunt growth, and increase morbidity from infectious diseases (NFHS-4, 2016). The signs and symptoms of anemia-pallor of the skin and of the conjunctiva, fatigue, shortness of breath, lack of appetite-are nonspecific and difficult to detect. Indeed, the clinical detection of anemia is influenced by so many variables, such as skin thickness and pigmentation, that it is unreliable unless the anemia is very severe (WHO, 1990). In resource-poor settings where routine laboratory testing of hemoglobin or hematocrit is not feasible, clinical signs should be regularly used to screen individual women and children. The purpose of this screening should be to identify high-risk subjects before the onset of life-threatening complications (WHO, 2001). Iron deficiency Anemia adversely affects transport of oxygen to tissues and results in diminished work capacity and physical performance. Iron deficiency anemia can result in impaired physical growth, poor cognitive development, reduced physical fitness and work performance and lower concentration on daily tasks (MoHFW, 2012).

Table 1 Hemoglobin levels to diagnose anemia (g/dl) and its severity

Age/ Population Group	Normal (g/dl)	ANAEMIA SEVERITY (Hb)		
		Mild (g\ dl)	Moderate (g\ dl)	Severe (g\ dl)
Children 6-59 months of age	>11	10 - 10.9	7 - 9.9	<7
Children 5-11 years of age	>11.5	11 - 11.4	8 – 10.9	<8
Children 12-14 years of age	>12	11 – 11.9	8 – 10.9	<8
Non-pregnant women (15 years of age and above)	>12	11 – 11.9	8 – 10.9	<8
Pregnant Women	>11	10 – 10.9	7 – 9.9	<7
Men, 15 years of age and above	>13	11 – 12.9	8 – 10.9	<8

(Source: WHO- Nutritional Anemia: Tools for Effective Prevention and Control, 2017)

Therefore there have been several attempts by the government and non-government organizations across the globe to combat anemia which can be short term approaches such as supplementation or long term such as food based approaches, food fortification, dietary diversity and nutrition education. Of the several programs for combating anemia in India were, National Nutritional Anemia Prophylactic Programme (NNAPP) (1970) to the Intensified National Iron Plus Initiative (Anemia Mukt Bharat) (2018) along with Poshan Abhiyaan and Jan Andolan.

The present paper attempts to review the progress made towards Anemia Mukt Bharat so far. The impact of these programs and policies especially the Intensified National Iron Plus Initiative (I-NIPI) program on the current status of anemia in various populations, gaps and way forward.

RESEARCH METHODOLOGY

To review the progress towards Anemia Mukt Bharat (AMB), relevant and available literature was searched using keywords like "anemia " or "anemia" or "anemic" or "anaemic" or "hemoglobin" or "iron deficiency" or "iron" or "NIPI" or 'Pandu Roga" and other similar keywords were searched in search engines like Google chrome, Bing and Yahoo. Also the literature available on Anemia Mukt Bharat dashboard was reviewed. Reports and papers on data related to prevalence of anemia, execution or monitoring and evaluation of anemia related programs were studied. The reviewed studies or reports were limited to being published in the English language.

RESULT AND DISCUSSION

Based on the available data from the above methods, the results and discussion have been divided into the following sections.

1. Prevalence of Anemia as reported by various Indian investigators

India accounts for the highest burden of anemia globally. In the last fifty years, despite substantial programmatic efforts, progress has been slow throughout the lifecycle including among adolescent girls (15-19 years), women of reproductive age (15-49 years) (WRA), pregnant women, and children (6-59 months), and continues to be a major public health problem (IFPRI, 2018).

Prevalence of anemia in various age groups as reported by various investigators across nation in past 5 years is shown in table 2. As can be seen in the table 2, there is a wide variation in the prevalence of anemia across various age groups and places could be possible due to the variation in the methods like Sahli's Haemometer technique, HemoCue 201+, Cyanmethemoglobin method and HemoCue 301+ method, as used by various investigators for Hemoglobin estimation. The prevalence of Anemia in infants (6-23 m) was found to be 96-98% in West Bengal, whereas for the same age group the prevalence was found to be 44-55% in Srinagar. The prevalence of anemia in pregnant women was 66% and 98% in Pune and Haryana respectively. On an average the prevalence was more than 50% in 10-19 y girls across various places.

Thus the overall data indicates a high prevalence across all age groups and places and there is an urgent need to improve their nutritional status and also provide social security nets which may be a short term measure until a long term food based approaches are adapted by the communities.

Table 2 Prevalence of anemia in various age groups as reported by various investigators in past 5 years

Year	Author	Place	Method of Hb estimation	Age group	Anemia Prevalence %	% Prevalence and Severity		
						Mild (g\ dl)	Moderate (g\ dl)	Severe (g\ dl)
2019	Caroline	Birbhum, West Bengal	HemoCue 201+	6-11 m	96.4	9.3	81.5	5.6
				12-23m	98.1	12.8	80.7	4.6
				24-35m	91.1	28.2	58.9	4.0
				36-39 m	80.0	45.0	30.0	5.0
2019	Swatantar Singh	Srinagar, Jammu and Kashmir	-	6m -2y	44.1	23.3	27.5	2.5
				2y-5y	55.8	25.8	19.1	1.6
2017	A.S. Ahankari	Osmanabad, Maharashtra	Sahli's haemometer	13-17 y girls	87.0	17	65	5
2017	Rekha Kumari	Patna, Bihar	Sahli's Method	10-14 year girls	53.0	43.0	5.6	4.4
				15-19 years girls	47.0	43.6	1.0	2.4
2017	Jhansi Rani	Guntur Andhra Pradesh	Cyanmethemoglobin	6-12 y	-	19.5	32.5	1.6
2016	S.C. Jai Prabhakar	Mysore, Karnataka	Cyanmethaemoglobin	6-10 y	91.4	7.2	74.3	9.9
2016	Shweta R. Chapparbandi	Kalaburagi, Karnataka	-	10-19 y girls	64.1	4.0	55.3	4.7
2016	Mishu Mangla	Sonipat, Haryana	Acid Haematin Method	Pregnant women	98.0*	41.7	37.0	15.8
2016	Ritesh P Kundap	Pune	Sahli's Method	Pregnant women	66	68.3	26.7	5
2015	Rakesh P.S.	Kollam, Kerala	HemoCue 301	<12 y	26.7	18.5	11.9	1
				12-14 y	35.3			
				>14 y	31.1			

*3.29% had very severe anemia (<4g/dl)

2. *Chronological Evolution in Anemia Control Programmes*

The table 3 discusses the evolution of anemia control programs in India. The first national anemia control programme started in 1970 which has been evolved to currently ongoing I-NIPI over the years. Over the years not only the beneficiary groups have changed, but also the dosage and tablet coating and strategy has changed and evolved. Initially, in 1970 the National Nutritional Anemia Prophylaxis Programme started with only three target group beneficiaries i.e. Pregnant, Lactating women and Children (1-5 years), but in 2012 Weekly Iron Folic Acid Supplementation Programme was launched and adolescent girls were also roped in the target group (MoHFW, 1991). In 2013, National Anemia Control Programme and Weekly Iron Folic Acid Supplementation (WIFS) Programme, were integrated into National Iron Plus Initiative that used the lifecycle approach (MoHFW, 2018).

In 2018, to intensify the efforts made towards anemia reduction, National Iron Plus Initiative (NIPI) was changed to Intensified National Iron Plus Initiative (I-NIPI), popularly known as Anemia Mukt Bharat, that used the 6X6X6 strategy. This strategy focused on an integrated approach of extending the age groups, interventions and institutional mechanisms.

The Anemia Mukt Bharat strategy has been designed, building up on the technical and operational evidence from National Iron Plus Initiative and Weekly Iron and Folic Acid programmes, with a multi-pronged approach and a more robust operational and accountability framework (MoHFW, 2018).

Table 3 Chronological Evolution in Anemia Control Programmes in India

Year	Programme	Target Group	Intervention	Highlight
1970	National Nutritional Anaemia Prophylaxis Programme (NNAPP)	Pregnant and Lactating women	60mg iron and 0.5mg folic acid daily for 100 days	In 1990, poor coverage of 19 % among pregnant women and 1% in children. Poor monitoring, compliance and lack of screening.
		Children 1-5years	20mg iron and 0.1 mg folic acid daily for 100 days	
1990	National Anaemia Control Programme	Pregnant, Lactating women and Children 1-5 years	Dosage changed to 100 mg iron in pregnancy. Anaemic person receives 2 tablets	Emphasis on screening of anaemia and improving coverage.
2012	Weekly Iron Folic Acid Supplementation Programme	Adolescent girls and boys enrolled in government/government aided/municipal schools from 6th to 12th classes, and Adolescent Girls who are not in school.	100mg elemental iron and 500µg folic acid for 52 weeks in a year	Fixed day approach for weekly IFA distribution, Branding of IFA as blue WIFS
2013	National Iron Plus Initiative (NIPI)	Life cycle approach	Targeted approach for anaemic persons and mass programme for non-anaemic persons	Tie-up with NRHM. Color of the IFA tablet for adolescent girls was changed to blue in color. Auto dispenser for feeding biweekly iron syrup to children.
2018	Poshan Abhiyaan	Prime Ministers Overarching Scheme for Holistic Nutrition is India's flagship programme to improve nutritional outcome		Leveraging technology, a targeted approach and convergence (food fortification, supplementation, anaemia)
2019	Intensified National iron plus initiative (I-NIPI).	6X6X6 strategy	The iron dosage was reduced from 100 mg to 60 mg for adults	Test, Treat and Talk Camp

3. Components of Intensified National Iron Plus Initiative(I-NIPI)

I-NIPI popularly known as Anemia Mukt Bharat(AMB), works upon the 6X6X6 strategy to combat anemia, i.e 6 beneficiaries, 6 interventions and 6 institutional mechanisms. The 6X6X6 strategy of I-NIPI is summarized in table 4. Under I-NIPI (AMB), six key interventions are delivered: prophylactic iron and folic acid supplementation; deworming; intensified year-round behaviour change communication campaign and delayed cord clamping in new-borns; testing of anaemia using digital methods and point of care treatment; mandatory provision of iron and folic acid fortified foods in government funded health programmes; and addressing non-nutritional causes of anaemia in endemic pockets with special focus on malaria, hemoglobinopathies and fluorosis. AMB dashboard and portal (www.anemiamuktbharat.info) is developed, wherein all resources relevant to anemia from various categories like series of webinars, PPTs, posters, badges, brochures, dockets, name slips, job aids, recipe booklets, operational guidelines, training toolkits, list of master trainers, playing cards, mantra booklet for adolescents, dialogue cards, logo in hindi and english, posters on interventions, do's and don'ts, pamphlets, standees, toran, signage board, selfie booth, GIF videos for social media, anemia score cards, quarterly progress reports, radio spots, jingles, policy briefs, field reports, info sheets, bookmarks, nutrient cards, placards for rally, which is updated from time to time.

The 6x6x6 strategy of Anaemia Mukt Bharat (AMB) as summarized in table 4, is a positive step and is ambitious in its goal to reduce the prevalence of anaemia by three percentage points per year.

Table 4 The 6X6X6 strategy of Intensified National Iron Plus Initiative (Anemia Mukt Bharat)

6 Beneficiaries	6 Interventions	6 Institutional Mechanisms
Children (6–59 months)	Prophylactic Iron Folic Acid Supplementation	Intra-ministerial coordination
Adolescent girls (15–19 years)	Deworming	Strengthening supply chain and logistics
Adolescent boys (15–19 years)	Intensified year-round Behaviour Change Communication Campaign (Solid Body, Smart Mind) including ensuring delayed cord clamping	National Centre of Excellence and Advanced Research on Anemia Control
Women of reproductive age	Testing of anemia using digital methods and point of care treatment	National Anemia Mukt Bharat Unit
Pregnant women	Mandatory provision of iron folic acid fortified food in public health programmes	Convergence with other ministries
Lactating Women	Addressing non-nutritional causes of anemia in endemic pockets, with special focus on malaria, haemoglobinopathies and fluorosis	Anemia Mukt Bharat dashboard and digital Portal - one-stop shop for anemia

4. Shifts in prevalence of Anemia in past decade and targets for anemia reduction

The world is 'off course' to meet the anaemia target, with 613.2 million (32.8% prevalence) adolescent girls and women aged 15 to 49 years being affected. Anaemia prevalence is substantially higher in pregnant (35.3 million, 40.1%) than non-pregnant (577.9 million, 32.5%) adolescent girls and women. No country is 'on course' to reach the anaemia target (Global Nutrition Report, 2020).

As seen in table 5 there has been limited progress at a very slow pace of nearly 1% reduction per annum between 2006 and 2016 across India**.**

Table 5 Shifts in prevalence of Anemia in past decade

Age group	% DECLINE IN 10 YEARS 2006-2016	NFHS-3 (2006)	NFHS-4 (2016)	National Target 2022 (reduce 3 % p.a)*
Children (6–35 months) (Hb<11g/dl),%	--	79	--	--
Children (6–59 months) (Hb<11g/dl),%	11 (1.1% p.a)	69	58	40
Adolescent girls (15–19 years) (Hb<12g/dl),%	2 (0.2% p.a)	56	54	36
Adolescent boys (15–19 years) (Hb<13g/dl),%	1 (0.1% p.a)	30	29	11
Women of reproductive age (Hb<12g/dl),%	2 (0.2% p.a)	55	53	35
Pregnant women (Hb<11g/dl),%	8 (0.8% p.a)	58	50	32
Lactating Women (Hb<12g/dl),%	5 (0.5% p.a)	63	58	40

***p.a- per annum**

5. *Trends in IFA coverage*

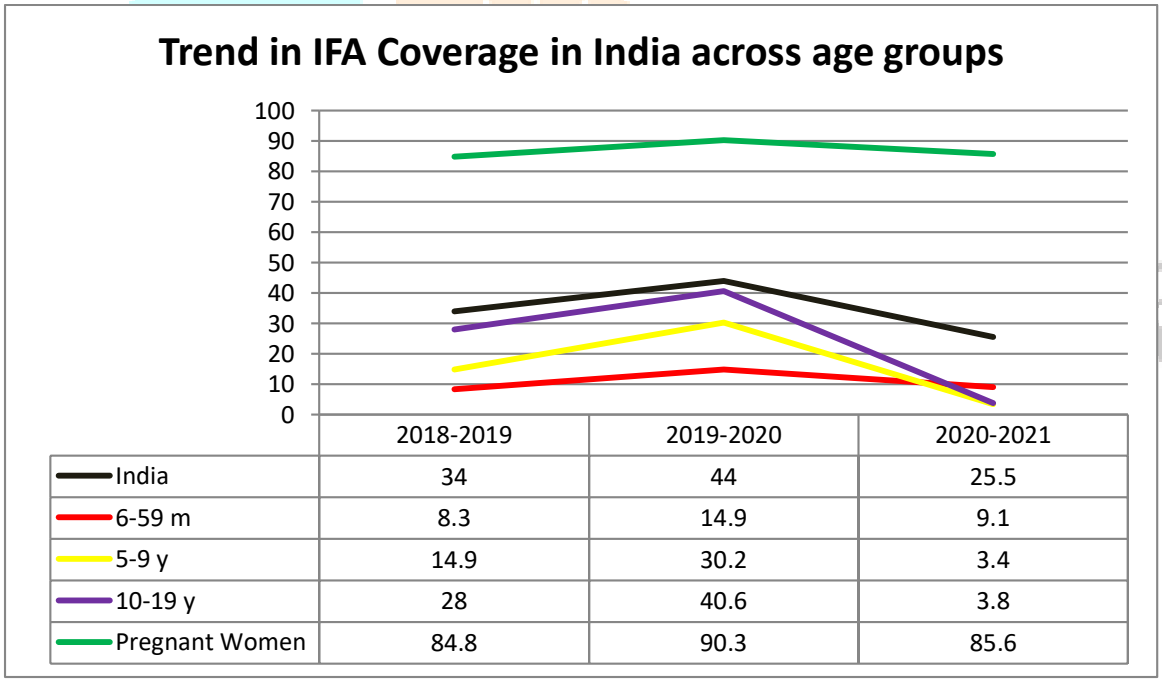
Anemia Mukt Bharat Index is calculated as the simple mean of the four selected coverage key performance indicators. Numerators are from HMIS Standard Report 2020-21 (up to Jun 2020). The numerators and denominators account for monthly consumption frequency for indicators related to children: 6-59 months, 5-9 years and 10-19 years. For HMIS 1.2.4 (Pregnant Women), the denominator is taken from HMIS 1.1 (total number of pregnant women registered for ANC) for the respective month. States/UT's are ranked based on AMB index with State/UT having highest index value ranked first and so on.

The HMIS data item code as per standard report is as follows:

1. HMIS 9.9: Children (6-59 months) provided 8-10 doses (1ml) of IFA syrup (Bi weekly)
2. HMIS 23.1 + 23.3: Children covered under WIFS Junior (5-9 years) provided 4-5 IFA tablets (In schools + out of school) per month
3. HMIS 22.1.1 + 22.1.3: Adolescent (10-19 years) provided 4 IFA tablets in schools + out of school per month
4. HMIS 1.2.4: Pregnant women (PW) given 180 IFA tablets.

From the figure 1 given below we can interpret that the coverage is around 80% only for pregnant women, whereas it is not even close to 50% for other beneficiaries. If we observe the trend as given in the Anemia Mukt Bharat Scorecards the mean value for India had risen to 44.0 (2019-20) from 34.0 (2018-19) had again dropped to an even below 25.5 (2020-2021). The downside curve can be assumed due to the nationwide lockdown due to pandemic of COVID-19.

Figure 1 Trends in Iron Folic Acid Supplementation coverage in India across age groups



	2018-2019	2019-2020	2020-2021
India	34	44	25.5
6-59 m	8.3	14.9	9.1
5-9 y	14.9	30.2	3.4
10-19 y	28	40.6	3.8
Pregnant Women	84.8	90.3	85.6

Source- anemiamuktbharat.info

DISCUSSION

Anaemia, affects approximately 2.36 billion individuals globally, and India carries its largest burden. Anaemia is highly prevalent among India's youth, affecting 41% of 1-4-year olds, 24% of 5-9-year olds, and 28% of 10-19-year olds. Iron deficiency anemia rarely causes death, but the impact on human health is significant. Anemia causes loss of 19.7 million disability adjusted life years annually, accounting for 1.3% of the global total. It is thus well known that prevalence of Anemia is high across all age group and its adverse consequences make it a cause of concern (CNNS, 2019).

The 6x6x6 strategy of Anaemia Mukt Bharat (AMB) is a positive step and is ambitious in its goal to reduce the prevalence of anaemia by three percentage points per year. The Government of India has also included staple food fortification (including rice fortification) as part of its comprehensive strategy (WCD, 2020)

Under the Anemia Mukt Bharat Strategy, the iron folic acid tablets that used to enteric coated will be sugar coated (MoHFW, 2018)

Nutrition education, counselling, and promotion aim to increase the intake of foods that are naturally high in certain micronutrients with high bioavailability (i.e. the degree to which the micronutrient is absorbed from the diet and available for the body's functions), and have a high content of factors to improve absorption coupled with a low content of inhibiting factors for micronutrient absorption (WHO, 2017).

The decline in the burden of anemia has been insignificant over the past 5 decades. Even though anaemia declined in India between 2006 and 2016, it remained highly prevalent in children and pregnant women (WCD, 2020).

As discussed in a paper by Kapil et.al (2019) the states do not accord priority as anemia is a hidden and silent disease unlike measles, diarrhoea, etc., which have explicit sign and symptoms. There is little or no counseling to the beneficiaries or the caretaker about the benefits and possible minor side effects after consumption of IFA leading to poor compliance. The weekly IFA supplementation to children aged 6-19 years is a relatively newer component of the programme. The village-level health and ICDS functionaries and school teachers are yet to have orientation and training about the beneficiaries, mechanics, and process of distribution as per I-NIPI.

CONCLUSION

From this review we can conclude that though, India has had programs to address anaemia for decades now. These programs have been only partially successful. The Anaemia Mukt Bharat, however, offers a new impetus to strengthen, focus and amplify work to address anaemia. For an accelerated reduction in anaemia, effective convergence of several governmental departments like health, education, water supply and sanitation is needed. In addition, the other focus actions of the AMB mission require acceleration, as do the social determinants of anemia (WCD, 2020).

More concerted efforts are required to promote dietary diversity, availability of iron-rich fruits and vegetables at affordable cost throughout the year, so as to utilize food based approach along with an intensified year-round behavior change communication campaign to bring about a sustainable change. Ensuring delayed cord clamping and for mandatory testing of anemia using digital methods, functional digital haemoglobinometers be made available, with training of staff at the institutes of contact point. Also the funds allocated under Anemia Mukt Bharat Strategy (Rs.109 lakhs per district) by state government are required to be effectively utilized for management and treatment of anemia (MoHFW, 2018).

It is therefore urgent that implementation of strategies and laid down policies for the prevention and control of anemia to be made more robust.

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