

Management of Moderate Anaemia among pregnant women of low socio-economic group

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Background information

- **Anaemia is the most widely prevalent nutritional deficiency (>2 bn)**
- **Higher prevalence in developing countries**
- **Prevalence of anemia in India is higher than the developing country average**

Causes and consequences of maternal anaemia

CAUSES

Poor pre-conceptional nutritional status

Chronic blood loss due to infections

Poor bioavailability of iron in phytate rich Indian diet

Maternal low dietary intake poor iron/ folate intake

CONSEQUENCES

Low maternal iron/folate stores

Immune depression

Maternal morbidity and mortality

Anaemia during pregnancy

Anaemia during lactation

Low iron in breast milk

Low fetal iron stores

Anaemia in infancy

Low birth weight deliveries
Prematurity / IUGR

Perinatal mortality

Major studies on management of anaemia prior to 1973

- **Studies from Chennai showed that iron and folic acid administration prevented fall in Hb levels during pregnancy**

- **Studies carried out in NIN, Hyderabad showed that iron and folic acid administration resulted in some improvement in birth weight**

National Nutritional Anaemia Prophylaxis Programme

- **India was the first developing country to take up a National Nutritional Anaemia Prophylaxis Programme to prevent further reduction in Hb levels among pregnant women and children in 1973**
- **At that time rural PHC services were in infancy**
- **ANC coverage was very low; there were no provisions for screening pregnant women for anaemia**
- **Therefore, an attempt was made to identify all pregnant women and give them 100 tablets containing 60mg of iron & 500mcg of folic acid to prevent fall in Hb**
- **In hospital settings, screening for anaemia and iron-folate therapy in appropriate doses and route of administration for the prevention and management of anaemia were incorporated as an essential component of antenatal care**

ICMR evaluation in late eighties showed that

- < 25% got IFA**
- < 10% of those who got IFA, took >90 tablets.**
- Even in small number who consumed 90 tablets, there was no significant improvement in Hb.**

Studies carried out in Delhi and Vellore demonstrated that even daily supervised administration of tablets containing 120, 180 or 240 mg of elemental iron does not correct anaemia in pregnant women.

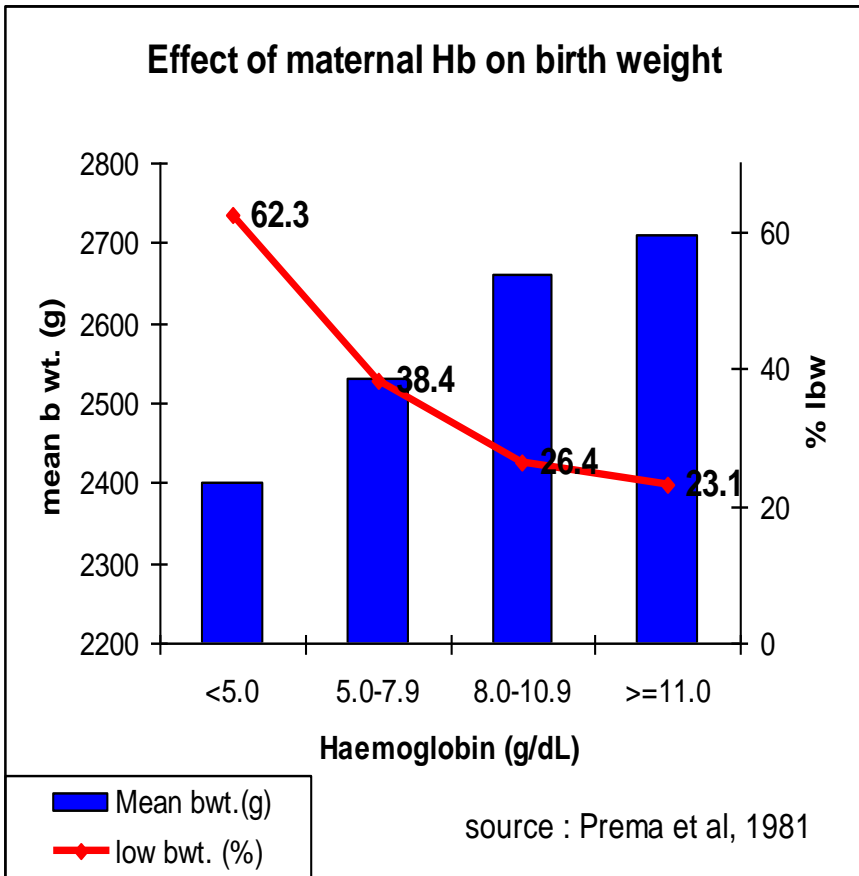
Studies carried out at NIN showed that a single Hb estimation by cyanmethaemoglobin method during second trimester of pregnancy was sufficient to detect, grade anaemia and initiate appropriate therapy.

By the nineties, rural PHC infrastructure and manpower had improved substantially; it was felt that screening for anaemia and treatment could be initiated.

National Anaemia Control Programme (NACP) envisaged:

- **all pregnant women will be screened for anaemia;**
- **those who are not anaemic will be given one IFA tablet daily (100 mg elemental iron and 500 mcg folic acid).**
- **anaemic women would be given two tablets of IFA and improvement in Hb monitored. Those who do not improve will be referred.**

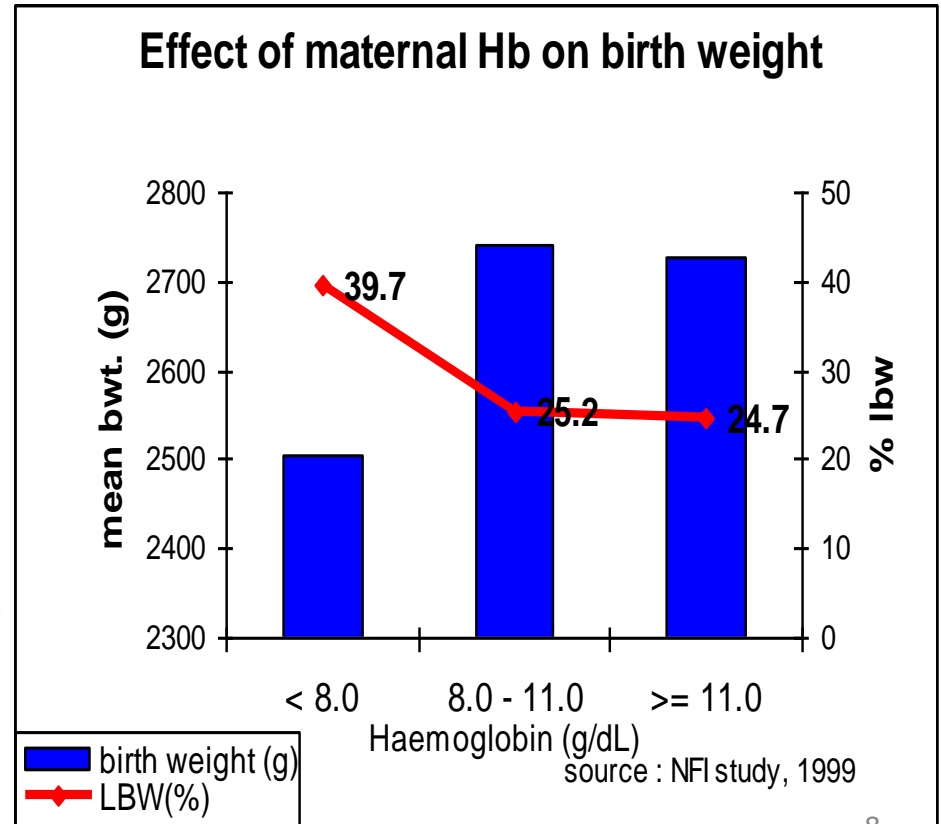
Effect of maternal Hb on birth weight



Study in early eighties showed that majority of pregnant women (LSEG) are anaemic and anaemia has adverse effect on birth weight.

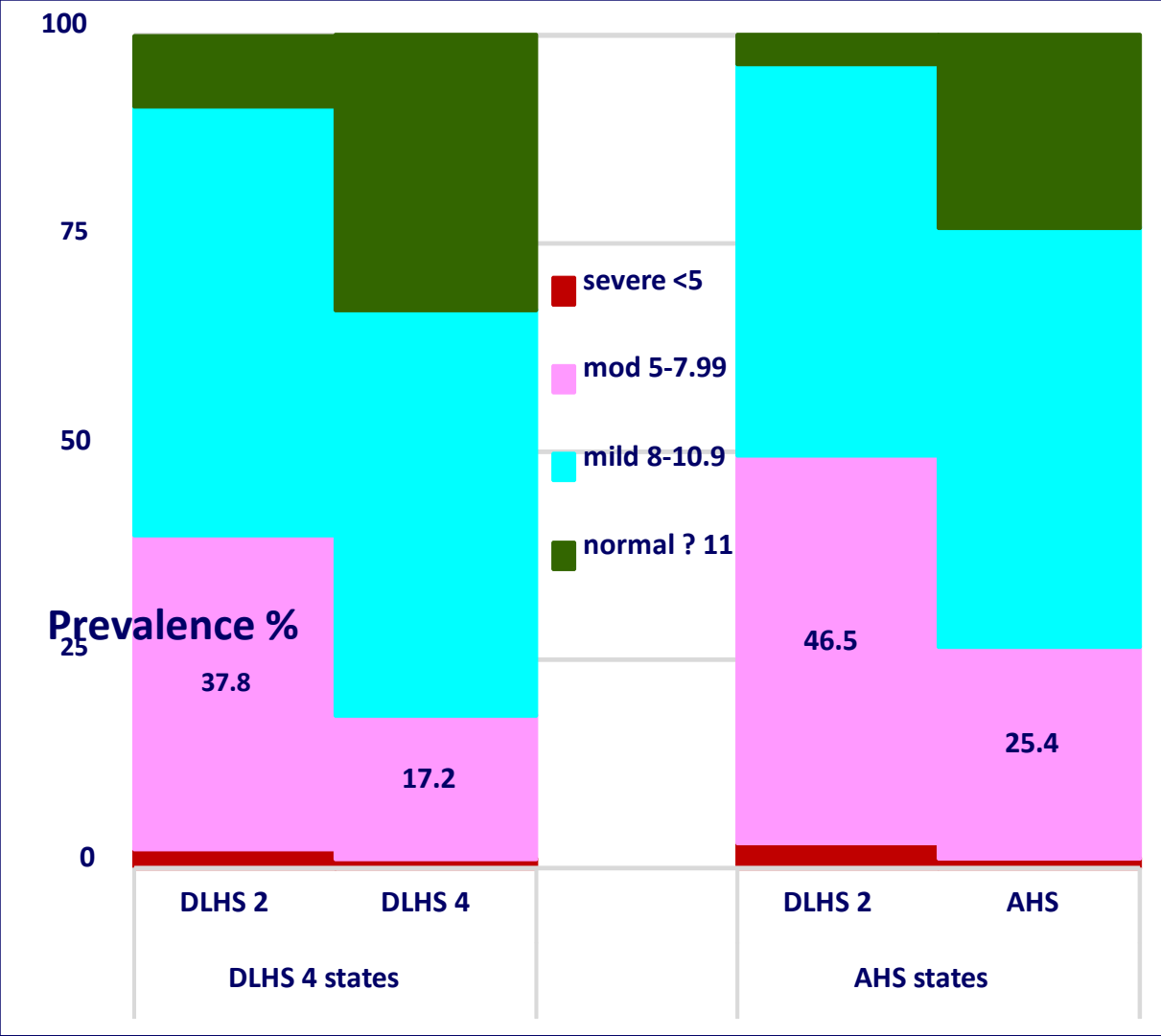
Delhi study (LSEG pregnant women) indicated that there is no change in prevalence of pregnancy anaemia or its adverse effect on birth weight.

Effect of maternal Hb on birth weight



Change in prevalence of moderate anaemia in pregnant women (DLHS 2, 4 & AHS)

DLHS 2 (2002) & DLHS 4 & AHS (2013-14)



- a) mean Hb improved, % anaemia reduced.
- b) substantial reduction in moderate anaemia
- c) moderate anaemia higher in AHS states both in 2002 and 2014.

Low % severe anaemia in AHS states & DLHS 4 states (2013-14).

Moderate anaemia (Hb 5.0-7.9 g/dL) associated with

- ✓ lower immunity,
- ✓ increase in the risk of maternal infections,
- ✓ low birth weight and
- ✓ higher perinatal loss

Studies carried out in the sixties and seventies of the last century had demonstrated that oral iron therapy is ineffective in improving Hb levels in women with moderate anaemia (Hb levels between 5.0-7.9 g/dL), when treatment is begun in second trimester of pregnancy.

Menon et al, 1968; Prema et al, 1982 & Bhatt et al, 1987 – suggested – moderately anaemic (5.0-7.9 g/dL) pregnant women - IM iron therapy significantly improves maternal haemoglobin and birth weight

Most of the earlier studies with IM iron therapy have been carried out with **iron dextran**.

About a week after initiation of IM therapy with iron dextran, pregnant women develop side-effects such as fever, arthralgia and myalgia and some discontinue therapy due to these minor but troublesome side-effects.

In recent years, IM injections of Iron sorbitol citric acid (less side-effects) has better continuation rates, has been preferred.

With injection of 900 mg of elemental iron as iron sorbitol citric acid complex, the rise in mean Hb levels was only about 2 g/dL.

This could be due to

- i) inadequate dosage of iron as a third of the injected iron sorbitol citric acid complex gets excreted in the urine.
- ii) associated folate or vitamin B-12 deficiencies limiting Hb synthesis.

In India, one-third of the neonates are LBW (b.wt.<2500g)

National surveys - improvement in factors responsible for LBW

- **Maternal nutritional status**
- **ANC**
- **Age at marriage**
- **Parity**

Leading to some reduction in Pregnancy anaemia

The strategy for treatment of anaemia in pregnancy as proposed in the Tenth Plan (2003) and NIPI (2013) consists of

- screening of all pregnant women for anaemia;**
- oral iron folate prophylactic therapy for all non-anaemic pregnant women (with haemoglobin more than 11.0 g/dL);**
- iron folate oral medication at the maximum tolerable dose throughout pregnancy for women with haemoglobin level 8.0 to 11.0 g/dL;**
- parenteral iron therapy for women with haemoglobin level between 5.0 and 8.0 g/dL;**
- hospital admission and intensive personalised care for women with haemoglobin < 5.0 g/dL.**

As indicated by recent National level surveys, the prevalence of overall anaemia and that of moderate anaemia has also declined. Hence, in terms of numbers, now its easier to manage moderate anaemia.

Facilities for biochemical estimation including blood sugar are now made available at PHCs . So screening all pregnant women for anaemia is surely possible. This will help in early detection and management of moderate anaemia.

Facilities in all the PHCs have been upgraded and they have now become health and well ness centres. Treatment with IM iron therapy is therefore possible in these centres.

Hb estimation in follow up will provide data on the increment in Hb levels

The non-responders can be identified and referred to tertiary care hospitals for further checkup and treatment.

Objectives

Primary

- **To investigate the acceptance, continuation rates of 10 injections of 1500mg iron as sorbitol citric acid complex**
- **To assess on impact of IM iron therapy with 1500mg iron on Hb levels of the pregnant women**

Secondary

To assess impact of the injections on

- **iron status of the pregnant woman and**
- **birth weight of the offspring.**

METHODOLOGY

Locale of the study

Defence Colony Maternity Centre, New Delhi

- **It had adequate infrastructure and manpower to undertake research studies;**
- **It had well-trained and motivated staff;**
- **This centre catered to the lower socio-economic group in the vicinity,**
- **The centre was easily accessible to the investigator.**

OPD Load: 60 new cases/week on two ANC days

Study design

Antenatal clinic in primary health care institution




Inclusion criteria

Women with Hb between 5-7.9g/dL in second trimester of pregnancy

No health problems ; no obstetric problems

Willing to come for daily injections for 10days and willing to come for follow up till delivery




Women enrolled were given IM iron sorbitol citric acid 150mg for 10 injections

Were followed up, recorded side effects experienced , Hb level checked .



Blood samples were collected at the initial visit and 10-12 weeks later in sub sample NIN estimated serum iron and ferritin level in the initial and follow up samples



Monthly follow up was carried out till delivery and information on course and outcome of pregnancy and birth weight were collected.

The study was approved by the Institutional Ethics Committee of Nutrition Foundation of India.

In the present study

Cyanmethaemoglobin method used

- ✓ **time-tested,**
- ✓ **more sensitive - accurate method for determination of haemoglobin**
- ✓ **rapid - 60 samples in one hour,**
- ✓ **easy**

(Crosby et al, 1964; ICSH, 1965; Sood et al, 1989; Balasubramanian and Malathi 1992)

Data was analysed using suitable statistical tests.

RESULTS

Sociodemographic profile at enrolment (No 419)	
Type of family	%
Joint	34.9
Nuclear	65.1
Family Size	
≤ 3	51.4
4-8	44.2
>8	4.4
Education of women	
Illiterate, read & write	23.2
Had schooling	68.6
College	8.2
Education of husband	
Illiterate, read & write	9.8
Had schooling	75.9
College	14.3

Obstetric and nutrition profile at recruitment	
Parameters	10 injections(419)
Age (yr)	24.0_±3.41
Gravida (no.)	2.1_±1.09
IPI (months)	29.9_±19.84
Height (cm)	151.1_±4.73
Weight (Kg)	50.0_±8.09

- 90% of these women were between 20-29 years of age
- 46% were primigravida and
- 33% were pregnant for the second time.
- IPI with one or more previous pregnancy :
12-23 months in 24.7% ;
24-35 months in 30.7% and \geq 36 months in remaining. All were in the second trimester of pregnancy;
- Mean gestational age at enrolment : 20.3 weeks (range 16-24 weeks).

CROSS-SECTIONAL POSTNATAL DATA

Total number of deliveries during the study period: 1357

Eligibility criterion:

- *had uncomplicated pregnancies*
- *did not receive IM iron therapy during the antenatal period*
- *did not have any complications during delivery*
- *had a live birth and the baby was weighed at birth using a digital tabletop weighing machine with 10g sensitivity*
- *were willing to get Hb estimation done in the postnatal period*

845 women who delivered in the health centre satisfied the above criteria

Intramuscular iron therapy

- **Moderately anaemic women – 783 (21%)**
- **467 women eligible (in 2nd trimester and with no systemic or obstetric problems) – counseled**
- **419 agreed to take IM iron therapy (10 injections of iron-sorbitol-citric-acid complex) – each injection containing**
 - **iron 150mg**
 - **folic acid IP 1500 mcg and**
 - **hydroxocobalamine acetate BP corresponding to hydroxocobalamine (Vitamin B₁₂) 150 mcg**
- **The nurses in the OPD gave the IM iron injections**
- **Majority of women (88%) had completed all ten injections suggesting that side effects were minor (nausea – 42%, vomiting – 8%, pain at injection site – 48% metallic taste – which responded readily to symptomatic treatment).**

Hb levels : Pre and post treatment

Weeks after completion of 10 injections	No	Mean Hb (g/dL)	
		Initial	Final
4-5	222	7.4 ±0.81	8.9±0.65
≥ 9	394	7.5±0.78	9.4±0.67

Pre vs post treatment Hb Paired t-test P<0.001

There was progressive increase in mean Hb with increase in duration and maximum increase was noted ≥9 weeks after completion of the IM therapy. The mean increase in the Hb levels was about 2 g/dL.

There were 41 (9.7%) pregnant women in whom Hb levels continued to remain below 8.0 g/dL even after 4-5 weeks after completion of IM therapy. They were referred to the tertiary care centres for further investigation and management.

Effect of Hb levels at delivery on bwt and impact of IM iron treatment on bwt

Hb g/dL	No.	Birth weight (g)
5.0 – 7.9	128	<u>2345.4+334.2*</u>
8.0-10.9	723	2846.9+351.2
≥11	54	3216.7+440.3
Total	905	2797.6+408.5
Women who received IM iron therapy	351	<u>2818.0 ± 292.9*</u>

Values are Mean ± SD. *P<0.001 by students t test

- i) Of **370** pregnant women, who had taken 10 injections, data on outcome of pregnancy and birth weight of the offspring could be obtained in **351**. Mean bwt - 2818 g
- ii) During this period there were 905 deliveries in the DCMC with the mean bwt : 2797 g.
- iii) Among these, 128 women with Hb levels 5.0 – 7.9 g/dL; mean bwt 2345g.

i) is significantly higher than iii)

The beneficial role of IM therapy for moderately anaemic pregnant women in second trimester is clearly evident.

Impact of IM iron on Hb, serum iron, and ferritin (at enrolment and 10-12 weeks after 10 injections)

Stage		Hb g/dL	Serum Iron $\mu\text{g/dL}$	Ferritin $\mu\text{g/L}$
Pre IM Therapy	Range	5.4-8.3	(28-421)	(1.8-55.1)
	Mean	7.2 \pm 0.82**	113.8 \pm 87.1*	12.8 \pm 12.2**
Post IM Therapy	Range	7.5-12.0	(41-279)	(6.8-95.4)
	Mean	9.1 \pm 0.83**	120.3 \pm 44.9*	36.1 \pm 22.8**

N = 72 pairs, paired t test. **P < 0.001, *P < 0.01

Iron deficiency came down from 66.7% to 8.3% after therapy

**Following 10 injections, ferritin levels showed substantial increase (from 12.8 to 36.1 $\mu\text{g/L}$);
Prevalence of iron deficiency (serum iron <12 $\mu\text{g/L}$) came down from 66.7% to 8.3%**

● **Conclusion**

- **Anaemia in pregnancy is still a major public health problem in India as more than 80% of them are anaemic**
- **Hb screening (cyanmethaemoglobin method) of pregnant women for anaemia during their first antenatal visit is mandatory and it is feasible in urban primary health care settings.**
- **IM therapy for pregnant women with moderate anaemia improves**
 - maternal Hb**
 - birth weight of the neonates**
 - maternal iron stores**
 - Maternal serum ferritin**

Thank You