

**STRATEGIES FOR PREVENTION AND CONTROLLING OF  
IRON DEFECIENCY ANAEMIA (IDA) AMONG UNDER 3 IN  
COMMUNITY**

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## **1. INTRODUCTION:**

The WHO estimates that more than 1/3<sup>rd</sup> of world population is anaemic. Iron deficiency anaemia (IDA) is a problem of serious public health significance, given its impact on psychological and physical development, behavior and work performance (1). It is the most prevalent nutritional problem in world today, affecting more than 700 million persons. Infants and young children are growing rapidly and have an increased demand for iron. The highest prevalence IDA is found among infants born preterm or with low birth weight, who have limited store, and among children between 6 and 24 months when the iron stores (they are born with) have become depleted.

There are studies, which show that anaemic children are at a high risk of long term impairment of mental and motor development, lower IQ level, lack of concentration and decreased physical activity (2). Iron deficiency also affects the immune system thus increasing the susceptibility of infections (3). Thus prevention, identification and treatment of IDA in infants and preschool children is of national importance. IDA does not exist in isolation. Its associates are poverty, protein energy malnutrition, concomitant other micronutrient deficiencies and infections. Strategies for the prevention control of IDA must, therefore, take care of most of the above conditions. Thus community control of IDA is a challenge.

At this point it is important also to assess our failures and successes with the prevention and control of IDA in pregnant women. It is imperative to build in program evaluation within the delivery system for monitoring. It is also important to have continued basic and operations research to identify alternative and more cost-effective strategies. Thus inherent flexibility has to be built into any program from the time of conception. This gives space for innovation. It also can break monotony, which has often resulted in poor performance of potentially simple public health interventions.

## **2. PREVENTIVE STRATEGIES TO CONTROL ANAEMIA:**

The four basic approaches for prevention of IDA are:

- a) **Supplementation with medicinal iron.**
- b) **Dietary modifications.**
- c) **The control of infection.**
- d) **The fortification of a staple food with iron.**

### **a). Supplementation with medicinal iron.**

Supplementation with medicinal iron has the advantage of producing rapid improvements in iron status. As a strategy it also has a desirable specificity. It can be targeted at the population groups at the greatest risk of becoming iron deficient. Supplementation programs do best to concentrate on high-risk groups such as

- Infants
- Preschool children
- Pregnant women

The questions which have to be addressed for children less than 3 years of age are:

*In which form should iron be given?*

For infants and pre-school children liquid iron preparations are to be used. Concentrated drops too can be considered for infants. Chewable and dispersible iron tablets are also available but these add costs without benefits.

*Which salt of iron should be used?*

Iron is available in heme as well as non-heme formulations. While absorption from the heme formulations is about 37% as compared to 5% from non-heme formulations, (4) the cost of the latter is higher, and thus not suitable for community programs. Non-heme iron formulations are in ferrous as well as ferric form. The absorption of ferrous salt is three times that of ferric salt (4). This difference in absorption rates increases with increasing dose. Hence ferrous salts are to be recommended for community based programs. There is almost no variation in the bioavailability of different ferrous salts like sulfate, lactate, succinate, glutamate, gluconate and others (4).

In a double blind study for gastro-intestinal side effects, comparison was done of different ferrous salts, like sulfate, gluconate, fumarate with a placebo. All the preparations had identical appearance. Two doses of elemental iron were compared separately, 222 mg per day and 105 mg/day. When 222 mg/day was given, the incidence of gastro intestinal side effects was 13% in the placebo and 25% in the iron group. When 105 mg/day of iron was compared with placebo no difference in the gastro intestinal side effects were found. Thus in lower doses, which are most likely to be used in community programs, there are no differences in the gastrointestinal side effects (5).

Ferric polysaccharide polymer is alleged to be as effective as ferrous sulfate causing fewer side effects. But since the absorption of the former is lesser and the cost ten times higher, the ferrous salt is preferred to it (6).

*What dosage schedule should be followed?*

The daily recommended iron requirements for children 6 months and older is about 1 mg/Kg /per day (7). However for the treatment of anemic children the dose of iron is 6 mg/Kg/Day. It has also be reported that daily iron supplementation results in reduced absorption due to mucosal fatigue. Hence intermittent schedules are recommended.. Thus it is clear that there is no single acceptable dose of iron for intermittent community based programs for children under 3 years of age.. Various community-based studies have used doses as low as 1mg/Kg/day to 6 mg/kg/day. As the 5th percentile of weight for age (NCHS standard) for a 6-month and 3 year old child is approximately 6 kg and 12 kg, respectively. Thus a single dose of 30 mg weekly will provide a 6-month-old child equivalent to 0.8 mg/kg/day and to a 3-year-old child 0.4 mg/Kg/day (7). This has to be combined with 50mcg of Folic acid. The 3-year-old child, it is hoped, will get additional iron from the modified diet induced by the program.

The question of sustainability of weekly iron supplementation is unanswered. Probably it may not be sustainable. Therefore alternative plans like certain weeks within a month or certain months within a year, on and off iron supplementation, has to be explored. For example, identifying diarrhea months (summer months) as a time to be off iron seems attractive but has to be studied through appropriately designed research work.

*From what age should supplementation be started?*

A newborn has adequate iron reserves that can last up to 6 months of age or until the birth weight has doubled. However, the iron reserves of infants born with a low birth weight become depleted earlier hence supplementation can be started earlier, as early as 2 months (8).

*What community out-reach strategies can be considered?*

Various community outreach strategies have been described but almost none of them have been tested for effectiveness (9).

**i) For Infants:**

|   | Strategy  | Advantages  | Disadvantages   |
|---|---|---|---|
| 1 | Preventive supplementation of iron in dosage of 2mg/kg/day for children of all age groups (9)   | Iron delivered in more than recommended doses to take care of losses at the time of absorption  | Tolerance<br>Sustainability<br>Cost for reaching 10% of Indian population   |
| 2 | Targeted supplementation to 6 - 24 month as the highest risk group (9)  | Feasible  | Frequency of administration and doses not described.  |
| 3 | Provide 2 bottles IFA syrup (containing 100ml/100 doses each) to mothers at 2 potential immunization contacts in the fixed day strategy – during measles immunization at nine months and DPT booster dose at 1.5 years(9) | Supply dependent on the health care system and administration dependent on family.  | Untested<br>Low immunization coverage rates<br>Low self administered IFA utilization during pregnancy raises doubts for success of this strategy<br>Strong IEC component to go with this not identified |
| 4 | For low birth weight and premature babies a daily dosage of 10mg elemental iron + 50mcg folic acid ifrom the age of 3 months onward   | Will prevent IFA stores from depletion before intervention begins   | Same as above: Identification of high risk infants<br>Motivation of mothers   |
| 5 | Partially supervised Intermittent IFA administration  | Feasible<br>Low cost<br>No new resources needed   | Un tested   |
| 6 | Above as a part of a program with<br>a) maternal IFA supplementation during pregnancy and lactation<br>b) Promotion of exclusive breast feeding for 6   | Multi-pronged<br>More chances of success<br>Physiological<br>Requires involvement of professional bodies of doctors to advise iron in convalescent phase, hence add credibility | Needs Political commitment<br>Continued Motivation<br>Untested<br>Maternal IFA supplementation arm weak inspite of a program more than 30 years old   |

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|  | <p>months</p> <p>c) Appropriately timed weaning with Dietary modification</p> <p>d) Prevention and treatment of infections</p> <p>e) IFA supplementation during recovery phase from all infections and at all points of contact with physicians / pediatricians for a brief duration</p> |  |  |
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**ii) For pre school children:**

Iron supplementation of pre school children is also important and requires special planning.

- Immunization contacts can be used for the application of the strategies.
- It can be accomplished wherever such children congregate such as in child care centers.
- To ensure proper supervision supplements can be administered by those responsible for the centers.
- Every opportunity must be taken to supervise supplement intake at child health clinic and during other contacts with health services.
- To ensure more uniform and higher compliance rate it may be more practical to give the children 7-8 week course based on a lower dose (30mg of elemental iron daily in tablet or liquid form) several times a year (10).

**b). DIETARY MODIFICATION:**

Dietary iron intake can be increased in poor communities in the following ways: -

- Promoting exclusive breast-feeding for as long as possible, given the high absorbability of breast milk iron (11)
- Encouraging timely introduction of weaning foods that either enhance iron absorption or have been fortified with iron (11).
  - By ensuring the people consume larger amounts quantities of their habitual food so that their energy needs are fully met. It has practical importance particularly in situations where it is difficult to improve the bioavailability of the ingested iron.
  - Enhancing the bioavailability of the ingested iron rather than its total amount is the second basic approach in dietary manipulation. This can be done by either promoting the intake of substances that enhance iron absorption like citrus fruits, vitamin C, including heme iron in the diet from meat and fish sources or by reducing the ingestion of inhibitors of absorption such as tannin and phytic acid. Heme iron present in meat, fish and poultry is not only better absorbed but increases absorption of non-heme iron of vegetable food. Promoting vitamin C intake in diet plays a crucial role to prevent IDA. In India vegetarianism is practiced widely and hence iron and vitamin C rich food items like green leafy vegetables and fruits probably hold the key for successful prevention.

- Fermentation and germination can enhance iron absorption by increasing vitamin C content and lowering phytic acid content.

The control of anaemia with commercially prepared iron rich weaning foods is likely to have only limited success among the urban poor as well as the rural communities due to its high cost. Weaning foods rich in iron and Vitamin C such as purees of cooked vegetable and raw fruits can be easily prepared at home and should be recommended.

Children in rural areas should be administered additional iron supplements as weaning among them can be delayed and inadequate. Prolonged breast-feeding is the rule in rural India where as the contrary is true of the urban areas where efforts to promote breast-feeding should be concentrated (11).

Education should be provided about proper feeding practices before and after periods of infective illness. This is especially important for young children as they are often placed on a semi starvation diet when ill. While giving this advice iron rich foods must be recommended. At all contacts with a health care provider iron supplementation must be advised if there is no contra-indication for it.

#### **c) CONTROL OF VIRAL, BACTERIAL AND PARASITIC INFECTIONS:**

Effective and timely curative care can diminish the adverse nutritional consequences of viral and bacterial disease. Proper curative services can at least contribute to a reduction in the duration and severity of infection. Immunization can strengthen the control of infections considerably. Parents should be convinced to continue feeding during infections. The control of these infections requires public health measures such as safe drinking water, improvement in environmental sanitation and in personal hygiene. When it comes to parasitic infestation, it has been established that hookworm and possibly trichuris play a role in etiology of anaemia in India by causing chronic blood loss. Therefore, deworming should be done routinely as part of primary health care.

#### **d) FOOD FORTIFICATION:**

The fortification of a widely consumed and centrally processed staple food with iron can be a long term cost effectiveness measure for improving the iron status of the children. It would include fortification of, sugar, rice, and fish paste with iron salts. This comes under the purview of the legislature and food processing industries. Therefore it requires a political and industrial infrastructure that does not exist in most developing countries (12).

### **COMPONENTS OF ANAEMIA CONTROL STRATEGY:**

#### **CHARACTERISTICS AND GOAL OF THE STRATEGY:**

The strategy should have the following features:

- a) Target levels of achievement should be set for the most vulnerable groups concentrating on severe anaemia (i.e. women in the second half of pregnancy and pre school children) (12).
- b) It should be integrated so far as possible into the national primary health care system so as to keep the cost low by sharing the facilities, training and supervision. This will further help to maximize health benefits through the strategies to support maternal and child health, general nutrition and other allied health care.

- c) It should be based on scientific epidemiological and therapeutic principles but should use technologies and approaches specifically adapted to the country and problem.
- d) Power of implementing the strategy should be vested upon the ministry or analogous body responsible for health. But it should involve other sectors such as agriculture, education and other relevant branches of responsible of government.

#### **SITUATION ANALYSIS:**

An important step in developing a control strategy is to carry out a situation analysis. The purpose is two folds:

- To establish a minimal data base for initial decision-making.
- To identify information gaps that are to be filled in time. At the very least ,information is needed on the following:
  - i. Epidemiology of anaemia, including age and sex distribution, geographical distribution and main causes of anaemia.
  - ii. The administrative infrastructure i.e. the distribution of health staff and facilities, community organization, transport and storage facilities, management of structure of primary health care including supply and budgeting etc.
  - iii. The geographical, nutritional and socioeconomic setting.
  - iv. Current and past experience showing what has been tried and found to be successful or unsuccessful for anaemia control in the country and in similar situation elsewhere.

#### **PUBLIC EDUCATION:**

The success of all approaches to anaemia control depends on the active participation of population. Hence there is a need for a public education support strategy which includes:

- Compliance with supplementation regimes.
- Changes in cooking and eating habits.
- Measures for infection control, including better personal hygiene.

#### **SUPPLIES:**

- Supplies are a basic consideration wherever the anaemia control strategy relies on supplementation.
- Periodic estimates of the quantities of various supplements should be done and a logistic system has to be developed to ensure regular delivery.
- This requires joint programming by those responsible for the anaemia control strategy, the ministry of health, medical stores and the essential drug program.
- Budget lines should be established for the necessary purchases.
- An appropriate packaging system like proper labeling with the direction for the correct intake of iron dosages.

#### **MONITORING AND EVALUATION:**

Prevalence and severity of iron deficiency should be evaluated. Detection through accurate laboratory tests in large-scale public health program is not always possible. Therefore identification of anaemia and its severity may have to be judged clinically by looking at tongue, mucosa of inner side of lips, conjunctiva of eyes etc. Monitoring and evaluation of technical and managerial progress of these strategies has to be done.

## **DISTRIBUTION OF RESPONSIBILITIES WITHIN THE HEALTH CARE SYSTEM:**

The responsibility should be divided as per the level of health facility available: -

### **a) AT THE COMMUNITY LEVEL:**

A community level worker, who may be the ANM, AWW, from the panchyati raj system or even a volunteer should:

- i). Ensure the IFA supplementation at childcare centers during the 2<sup>nd</sup> half of pregnancy.
  - ii). Ensure supplements to child care centers and school.
  - iii). Carry out health and nutritional education for dietary modification and infection control.
  - iv). Refer sick children for timely curative care.
  - v). Improve levels of community and personal hygiene.
- iv) Screen for high-risk groups, like infants born pre-term or of low birth weight or to severely anemic mothers, if possible.

### **b) AT THE LEVEL OF HEALTH CENTER:**

The health care provider should:

- i). Supplementation all pregnant women with IFA during the 2<sup>nd</sup> half of pregnancy.
- ii). Screen high-risk groups.
- iii). Treat all cases of anaemia.
- iv). Refer patients with severe anaemia to district hospitals for treatment.
- v). Treat patients with parasitic infestations.
- vi). Carry out health and nutritional education.

### **c) AT THE LEVEL OF DISTRICT OR RURAL HOSPITAL i.e. FIRST REFERRAL LEVEL:**

Health care provider should:

- i). Screen individuals in high-risk groups.
- ii). Test those where anaemia is suspected clinically.
- iii). Treat all cases of anaemia.
- vi). Diagnose and treat all cases of infections and infestation.

### **d). AT THE LEVEL DISTRICT HEALTH OFFICER:**

D. H. O should:

- i). Monitor the epidemiological trends in IDA.
- ii). Organize and integrate the treatment and prevention of IDA into the PHC;s at all levels.
- iii). Maintain supplies at all levels.
- iv). Organize training for health personnel in the treatment and prevention of IDA.
- v). Mobilize district resources and coordinate with other sectors.

**e) AT THE NATION LEVEL:**

The national health administrator should:

- i). Monitor and evaluate the technical and logical aspects of the program.
- ii). Ensure efficient flow of suitable supplies.
- iii). Mobilize resources to overcome problems.

The anaemia control program should not be seen as an isolated activity but as an integral part of total health care and socio-economic development.

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