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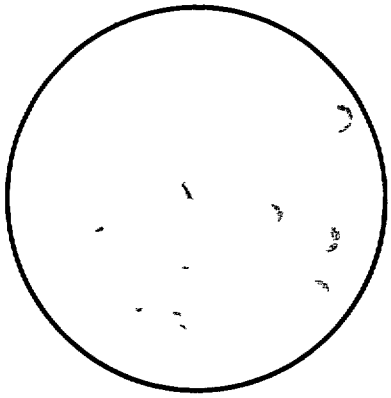

Guidelines for the Control of Maternal Nutritional Anemia

A Report of the International Nutritional Anemia Consultative Group (INACG)®

I. Introduction

Anemia is a major and pressing problem Recent World Health Organization (WHO) statistics indicate a worldwide prevalence of about 30%, with even higher figures in developing countries Young children and pregnant women are the most affected groups, with an estimated global prevalence of about 40% and 50%, respectively Although many causes of anemia have been identified, nutritional deficiency due primarily to a lack of bioavailable dietary iron accounts for well over half the total number of cases Deficiency of the vitamin folate is a contributing factor in many areas Nutritional anemia is most prevalent in Africa and South Asia, but even in industrialized countries a significant number of women have insufficient nutrient reserves to meet the increased requirements of pregnancy These guidelines outline short and long range strategies for controlling prenatal nutritional anemia

II. Consequences of Iron and Folate Deficiency

Consequences to the Mother

Iron needs increase significantly during pregnancy because of growth of the fetus and placenta and expansion of the mother s blood volume Women frequently enter pregnancy with inadequate iron stores, and thus the increased demands associated with pregnancy result in anemia—i e , a decline in hemoglobin concentration to well below the normal range for healthy pregnant women Adult women living at sea level are anemic when hemoglobin levels fall below 12 0 g/dL in nonpregnant women or below 11 0 g/dL in pregnant women

> *Women frequently enter pregnancy with inadequate iron stores, and thus the increased demands associated with pregnancy result in anemia*

Anemia with hemoglobin concentrations below 11 0 g/dL is associated with decreased work capacity and mental performance and probably with impaired resistance to infection Anemic women are less tolerant of blood loss at delivery, particularly when hemoglobin levels fall below 8 0 g/dL When malaria and/or hookworm complicate iron deficiency, anemia can be more severe, with hemoglobin levels below 6 0 or even 4 0 g/dL At 6 0 g/dL, evidence of circulatory decompensation becomes apparent Women experience breathlessness and increased cardiac output at rest At this stage, added stress from labor, sponta

neous abortion, or other major complications can result in maternal death

Without effective treatment, maternal death from anemic heart failure and the effects of severe hypoxia is likely with a hemoglobin concentration of 4 0 g/dL Even a blood loss of 100 mL can cause circulatory shock and death Moreover, malaria and pregnancy both increase folate needs, and folate deficiency compounds anemia

Identify and reinforce those local dietary and health practices that improve iron nutriture

Consequences to the Newborn

Low birth weight and increased perinatal mortality are associated with maternal anemia Low birth weight is a major factor in subsequent infant morbidity and mortality Any intervention that decreases the prevalence of low birth weight reduces infant mortality Maternal iron and folate deficiencies have relatively little effect on hemoglobin concentrations in the newborn Nevertheless a major benefit of preventing these deficiencies in the mother is a healthier baby

Benefits of Preventing Iron and Folate Deficiencies

To the mother

- **Improved work capacity**
- **Improved mental performance**
- **Improved resistance to infection**
- **Safer pregnancy and delivery**

To the newborn

- **Higher birth weight**
- **Improved health**

III. Guidelines for Short-Range Intervention

Iron Supplementation

Programs for the control of maternal nutritional anemia aim to provide sufficient absorbable iron to women before and during pregnancy As a short range measure, give all pregnant women an oral iron preparation at the first prenatal visit This should occur by the fifth month of pregnancy Continue treatment throughout the remainder of pregnancy and during the first months of lactation Ferrous sulfate is inexpensive and is usually the preparation of choice A daily dose of 120 mg elemental iron in two tablets containing 60 mg each (300 mg hydrated ferrous sulfate contains 60 mg iron) taken on an empty stomach is preferred However, in the presence of undesirable side effects, the dose may be given with or immediately after a meal Some women experience minor side effects, such as a change in stool character or abdominal distress, especially during the first week Assure them that these mild symptoms are temporary If the side effects are debilitating, minimize them by dividing the dose between two meals, or start with smaller daily doses of 30 mg or 60 mg iron In women with relatively mild iron deficiency, a single tablet providing 60 mg per day is probably adequate

Folate requirements also increase during pregnancy Some prenatal supplements contain a combination of 60 mg iron and 250 μg folate, providing 500 μg folate daily when two tablets are taken The cost of iron tablets is not increased significantly when folate is added Folate deficiency is not a problem in all populations, but routine addition of folate to prenatal iron supplements will maintain adequate folate status in individuals whose diets supply insufficient folate

Importance of the Delivery System

The delivery system is critical to a supplementation program Many iron supplementation programs have failed because the tablets did not reach the mothers or the mothers did not take them

Schedule of Iron Supplementation for Pregnant Women

Pregnant women from 4th or 5th month of pregnancy through early lactation

Two tablets, each containing 60 mg elemental iron* and 250 μg folic acid, taken once daily**

*** 300 mg ferrous sulfate (hydrated) is equivalent to 60 mg elemental iron**

**** Usual administration is one tablet, two times daily, without food In the presence of undesirable side effects, take dose with or immediately after a meal, or decrease dose to 30–60 mg daily for a week before taking full dose**

Exert all efforts to achieve reasonable program efficiency

Generally, iron tablets can be distributed through existing channels of the country s health care delivery system The program must be considered integral to (and not added on to) the system Iron supplementation is usually integrated into maternal and child health (MCH) programs within the context of primary health care Attendance at prenatal clinics is often poor in developing countries, especially in rural areas Use community health care workers to reach mothers and increase distribution Alternatively, use traditional care givers such as midwives or traditional birth attendants

To ensure efficient delivery of supplements and a high level of adherence, implement the following before and throughout the course of the program

1 Obtain the full commitment of health policy makers and planners at the top level and managers at the middle level through intensive and periodic orientation in the program s benefits and its place in the health care delivery system

2 Motivate traditional care givers and supervise them closely

3 Educate, train and retrain all personnel adequately

4 Ensure a continuous supply of supplements and provide other logistic requirements (e g , storage areas and monitoring forms)

5 Educate mothers and the community (including husbands, local leaders, adolescent girls, and young women) about the program s importance, citing benefits they will derive from the program within the context of their own health priorities Use traditional community and women s organizations (including female initiation societies) social clubs and schools to maximize community involvement cooperation, and support

6 Assure mothers that the side effects of iron supplements are harmless and temporary Provide for dosage changes if side effects persist

7 Monitor program implementation continuously and evaluate program effectiveness periodically

IV. Guidelines for Long-Range Intervention

The success of interventions depends on the participants perception that the program addresses their own health interests and that the project is supported by local and national leaders

Dietary modification and fortification are the most effective long range strategies for alleviating nutritional anemia Fortification has the advantage that it increases the iron content of the diet without a change in dietary habits However, there are problems in identifying foods suitable for fortification and absorbable iron compounds compatible with those foods An alternative is to improve iron nutrition by increasing the bioavailability of dietary iron and by modifying dietary habits (e g , by increasing the intake of ascorbic acid containing foods and reducing the intake of foods that are known to inhibit iron absorption) This may

be difficult, especially in populations with very limited financial and food resources

Iron Fortification

The effectiveness of any fortification program is enhanced by determining the prevalence of and reasons for iron deficiency in the population First, establish the relative importance of total dietary iron content, decreased bioavailability, and increased blood losses from for example, hookworm infection Failure to eliminate hookworm may negate the effects of an otherwise effective fortification program

Elements for Successful Iron Supplementation Programs

- **Commitment from top-level policy makers and planners down to village level implementers**
- **Motivated and closely supervised primary-level workers**
- **Adequately educated and trained personnel at all levels**
- **Adequate logistics**
- **Well-informed, motivated mothers and involved, supportive communities**
- **Continuous monitoring and periodic evaluation**

Next, identify a suitable food or foods to fortify Choose foods with the following characteristics

- Commonly and widely consumed and preferred by the population at risk
- Centrally processed
- Technologically and economically possible to fortify

Successful pilot fortification programs have used whole wheat flour, salt, sugar, 26% fat milk powder, cookies, curry powder, and fish sauce as vehicles and various iron compounds as fortificants Fortification should produce minimal changes in the taste, texture, and appearance of foods Targeted groups may reduce their consumption of fortified staples or condiments if the foods are radically changed, thus countering the aims of the program

Identifying foods suitable for fortification may be difficult in developing countries where few foods are centrally processed Although salt and sugar may be suitable for national and regional fortification programs, other foods may be better for programs targeted at specific population groups For example, in a successful program for schoolchildren in Chile, cookies containing dried hemoglobin were provided with school lunches Similarly, infants in that country were fed formula prepared from full fat (26%) milk powder fortified with both iron and ascorbic acid

Another problem is the poor bioavailability of most dietary iron Consequently, any fortification iron added to the diet also is poorly absorbed Consider these two strategies to overcome the problem Use an iron compound that is less susceptible to dietary inhibitors, add ascorbic acid a potent promoter of iron absorption, to the iron fortificant

Regarding dietary fortification with folate data indicate that a cereal such as maize can be fortified successfully with folate and that the consumption of folate fortified maize prevents prenatal folate deficiency

Fortification programs are urgently needed because they offer the best way to ensure that women enter pregnancy with normal hemoglobin concentrations and sufficient nutrient reserves to cope with the extra requirements of pregnancy *A successful fortification program requires cooperation among scientists, the food industry and government agencies*

Dietary Modification

Where opportunities for fortification are limited, increase iron intake and improve iron and folate bioavailability by modifying the population s methods of selecting, processing, and consuming food It is rarely desirable or easy to change people s eating habits radically Therefore be familiar with existing dietary conditions and the availability and cost of foods, and base dietary modifications on that knowledge Be aware of food taboos (especially before, during, and just

after pregnancy), intentional caloric restriction during pregnancy, the symbolic value of particular foods, the use of traditional medicines, and preferences for foods that affect the absorption of iron or folate Local conversion from iron pots to aluminum cookware also may reduce the amount of iron available These factors will influence the method and extent of dietary modification

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Dietary variety also depends on economic and cultural factors Nevertheless, in addition to increased intake of foods rich in bioavailable iron, encourage increased eating of vegetables and fruits high in vitamin C with the main meal Identify and reinforce those local dietary and health practices that improve iron nutriture Discourage consumption of tea and other tannin-containing products with meals, because these products can reduce iron absorption

Complicating Conditions

In communities in which iron deficiency anemia is complicated by malaria, hookworm infection, and schistosomiasis, treat these conditions as well Where malaria is endemic, administer antimalarial drugs at the mother s first prenatal visit and provide them throughout pregnancy

Bear in mind the importance of clean water A safe water supply decreases enteric infections and increases nutrient absorption

Suggested Reading

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