Anaemia in the Eastern Mediterranean Region

Anna Verster[1] and Jolieke C. van der Pols[2]

فقر الدم في إقليم شرق المتوسط

آنّا فيرستر، ويوليبكه فان دربولس

فقر الدم الناجم عن عوز الحديد، هو مشكلة وخيمة في حقل الصحة العمومية على الصعيد العالمي. ولهذه الحالة تأثيرات سلبية في القدرة على العمل، والأداء الذهني، والحمل. وهي لا تتحسن فيما يبدو بالمعالجة اللاحقة بمركّبات الحديد. وفي بلدان إقليم شرق المتوسط ينتشر فقر الدم بين النساء والأطفال دون سن المدرسة بمعدلات عالية (٢٠-٦٠٪). وهناك أسباب كثيرة لفقر الدم في الإقليم، مثل تدني التوافر الحيوي للحديد المأكول، وتناول مقادير كبيرة من مثبطات امتصاص الحديد، وأنماط الحمل السائدة وأمراض الطفيليات. وثمة حاجة ملحّة لأن تقوم بلدان الإقليم كافةً بمكافحة عوز الحديد وفقر الدم. وتناقش هذه المقالة استراتيجيات مناسبة لهذا الغرض.

Iron deficiency anaemia is a serious worldwide public health problem, having negative effects on work capacity, intellectual performance and pregnancy, apparently irreversible by subsequent iron therapy. In the countries of the Eastern Mediterranean Region (EMR), the prevalence of anaemia in women and preschool children is high (20–60%). Anaemia in the EMR has many causes, such as low bioavailability of the iron consumed, high consumption of inhibitors of iron absorption, child-bearing patterns and parasitic infections. There is an urgent need for all countries in the Region to control iron deficiency and anaemia; suitable strategies are discussed.

L'anémie dans la Région de la Méditerranée orientale

L'anémie ferriprive constitue dans le monde entier un grave problème de santé publique qui a des effets négatifs sur la capacité de travail, les performances intellectuelles et la grossesse, lesquels apparemment ne sont pas réversibles par un traitement martial ultérieur. Dans les pays de la Région de la Méditerranée orientale, la prévalence de l'anémie chez les femmes et les enfants d'âge préscolaire est élevée (20–60%). L'anémie dans la Région de la Méditerranée orientale a de multiples causes, telles la faible biodisponibilité du fer alimentaire ingéré, une forte consommation d'inhibiteurs de l'absorption du fer, les grossesses rappprochées et nombreuses ainsi que les infections parasitaires. La lutte contre la carence martiale et l'anémie est donc une nécessité impérieuse pour tous les pays de la Région; des stratégies appropriées sont examinées.

[1]*Regional Adviser, Nutrition, World Health Organization Regional Office for the Eastern Mediterranean, Alexandria, Egypt;* [2]*Former intern, Nutrition Unit, World Health Organization Regional Office for the Eastern Mediterranean.*

Introduction

Iron deficiency anaemia is a problem of serious public health significance, given its impact on psychological and physical development, behaviour and work performance. It is the most common nutritional disorder in the world, as it is in the Eastern Mediterranean Region (EMR). Data collected indicate that a total of 149 million people in the EMR are iron-deficient or anaemic according to WHO criteria [*1*], 83 million of them anaemic women [2].

Anaemia, and micronutrients in general, have recently received a great deal of attention in international forums. WHO and UNICEF jointly adopted new goals for the 1990s, aiming amongst other things to control iron deficiency by the turn of the century. The World Summit for Children (New York, 1990), attended by high-level representatives from over 150 countries, endorsed these goals.

The conference *Ending hidden hunger: a policy conference on micronutrient malnutrition* (Montreal, 1991) focused on how to overcome micronutrient malnutrition.

The International Conference on Nutrition (ICN) held in Rome, Italy, in December 1992, adopted the nutrition goals of the World Summit for Children, one of which was to reduce by one third (of 1990 levels) the prevalence of iron deficiency anaemia among women of childbearing age. In the ICN World Declaration and Plan of Action for Nutrition, strategies and actions are outlined for achieving this goal.

The present paper provides an overview of current progress on anaemia control in the EMR by reviewing the results of recent assessment/analysis activities, intervention measures and evaluation activities. A brief introduction to anaemia, its epidemiology, etiology and consequences is given below.

Iron deficiency and anaemia

Anaemia epidemiology

Nutritional anaemia refers to a condition in which the haemoglobin content of the blood is lower than normal, as a result of a deficiency of one or more essential nutrients (usually iron, less frequently folate or vitamin B12), regardless of the cause of such deficiency [2]. There are no sharp cut-off points below which anaemia can be stated as present. However, standards below which anaemia is likely to be present at sea level have been set out by WHO [*3*] and are presented in Table 1. Anaemia is diagnosed by haemoglobin concentration. This is however a relatively insensitive index of milder degrees of nutrient depletion. By the time anaemia is diagnosed, the person in question is already suffering from a marked degree of nutrient deficiency [2]. Since there are multiple causes of anaemia, and since iron deficiency can exist without haemoglobin levels being lowered, there are potentially four different situations or populations:

1. those iron anaemic and iron deficient
2. those iron deficient but not (yet) anaemic
3. those anaemic but not due to iron deficiency
4. those iron replete with normal haemoglobin.

Table 1 **Haemoglobin levels indicative of anaemia in populations living at sea level**

Age/sex group	Haemoglobin level (g/dl)
Children 6 months–5 years	< 11
Children 6–14 years	< 12
Adult males	< 13
Adult females (non-pregnant)	< 12
Adult females (pregnant)	< 11

Source: [3]

Table 2 **Epidemiological criteria**

Category	Prevalence (%) Severe	Moderate	Mild
Mild/moderate anaemia[a] or 25% < haematocrit < 33%	> 40	10–39	1 –9.9
Severe anaemia (Hb < 7 g/dl) or haematocrit < 24.9%	> 10	1– 9.9	0.1–0.9

[a]*According to WHO criteria; see Table 1*
Sources: [1,8]

Causes of anaemia other than nutrient deficiency include malaria, intestinal parasites and genetically determined haemoglobinopathies such as thalassaemia [*3,4*]. It is generally held that at least half of the anaemia worldwide is due to nutritional iron deficiency, and that subclinical iron deficiency, also related to functional disadvantages, is as widespread as iron deficiency with anaemia. Therefore, anaemia prevalence can generally be taken as an indicator of the extent and trends of iron deficiency [*2,3*].

Subjects affected by anaemia are, in approximate descending order of severity, pregnant women, preschool children, low-birth-weight infants, other women, the elderly, school-age children and men.

On a population level, anaemia prevalence can be distinguished as mild, moderate or severe. Appropriate epidemiological criteria [*3*] are presented in Table 2.

Etiology

Body iron can be considered as two main components, functional iron and storage iron. The functional component is largely found in the circulating haemoglobin (and a smaller quantity in body tissue, myoglobin and enzymes). A deficiency of iron in the functional component does not ordinarily occur until stores are completely exhausted. The storage component, found as ferritin and haemosiderin in liver, spleen and bone marrow, serves as a reserve source for the functional component.

The diminishing of iron stores results from an imbalance between iron absorption and the body's needs. Such an imbalance can generally arise from: low dietary iron intake; poor absorption/utilization of ingested iron; or increased demand. Demand is increased in case of growth, blood loss related to menstruation, childbirth and chronic parasitic infections such as malaria, hookworm and schistosomiasis. Fig. 1 gives a schematic overview of causality of iron deficiency and anaemia.

Dietary iron requirements

A dietary intake of iron is needed to replace iron lost in the stools and urine and through the skin. These basal losses represent approximately 0.9 milligrams of iron per day for an adult male and 0.8 milligrams per day for an adult female. For women of reproductive age, the extra iron losses in menstrual blood must be taken into consideration. When basal losses are added, the total iron loss for menstruating women is about 1.25 milligrams per day.

Although menstruation-related losses are reduced to nil during pregnancy, additional iron is nevertheless required for the fetus, the placenta and the increased maternal blood volume. This amounts to approximately 1 000 milligrams of iron over the entire pregnancy. Requirements per day during pregnancy rise from 0.8 milligrams per day in the first trimes-

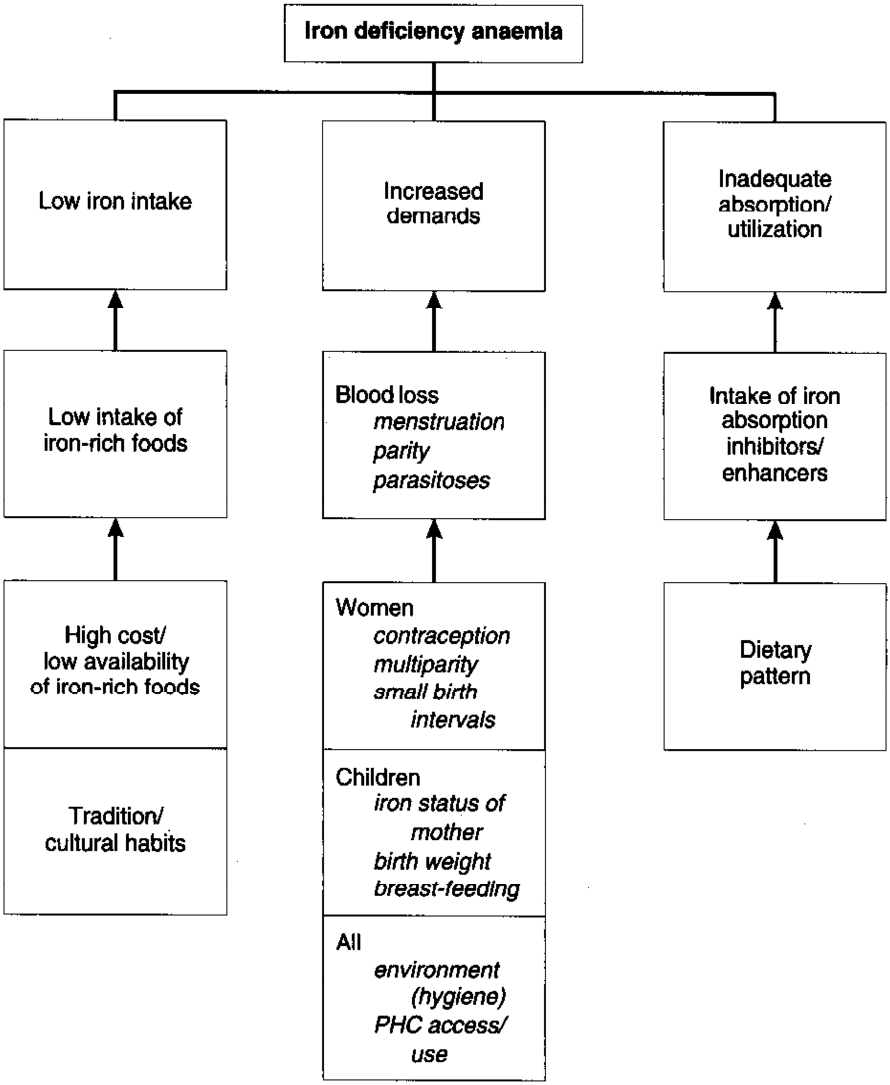

Figure 1 **A schematic overview of causality of iron deficiency and anaemia**

ter to a high of 6.3 milligrams per day in the third trimester.

Infants, children and adolescents require iron for their expanding red cell mass and growing body tissue. Overall, the requirements for infants and children are substantially lower than in adults. But since they have lower total energy requirements than adults, they eat less and are thus at greater risk of developing iron deficiency, especially if their dietary iron is of low bioavailability.

Iron sources, bioavailability, enhancers and inhibitors

Dietary iron may be considered as being composed of two distinct pools, haem iron and non-haem iron. Haem iron is highly available (20% to 30% absorbed) and is found in animal foods. Non-haem iron is found in cereals, pulses, fruits, vegetables and dairy products and comprises the major source of dietary iron. Absorption of non-haem iron is highly variable (1% to 40%), depending on enhancing and inhibiting factors.

Factors known to stimulate absorption (bioavailability) of non-haem iron are the presence of meat, poultry, seafood and various organic acids, particularly ascorbic acid. Important iron absorption inhibitors are polyphenols, including tannins, phytates, certain forms of proteins and some forms of dietary fibre. Foods that contain these factors and therefore have a strong inhibiting effect on iron absorption include tea, coffee, egg yolk and bran.

In addition to the nutritional interactions, non-haem iron absorption is significantly affected by an individual's iron status. Absorption decreases when iron stores increase and conversely a decrease in body iron stores is associated with an increase in absorption.

Concerning the iron absorption from a complete diet, typical meals can be separated into three broad categories, of "low", "intermediate" and "high" bioavailability. Characteristics and estimated iron absorption levels of these categories of diets are presented in Fig. 2.

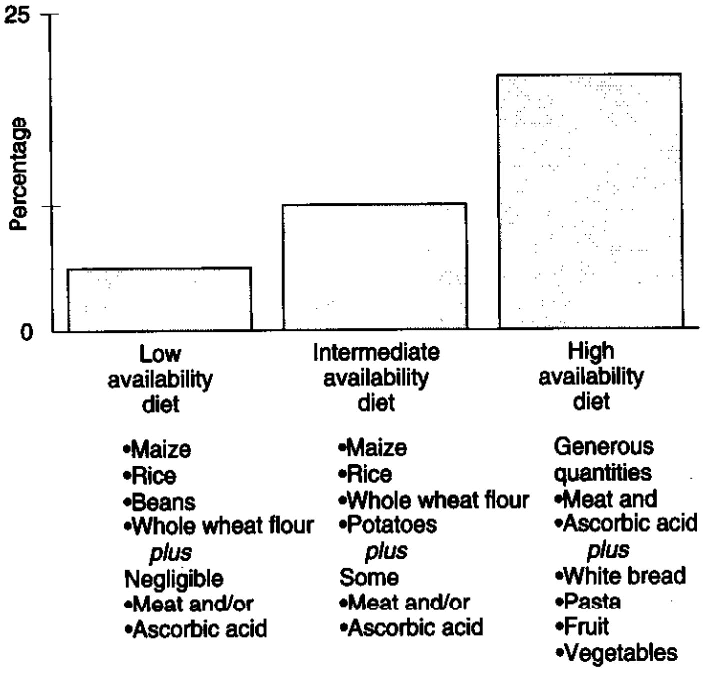

Figure 2 **The effect of iron absorption enhancers on the absorption of non-haem iron** *Source: [4]*

Consequences of iron deficiency and anaemia

Iron deficiency and anaemia have repercussions on working capacity, intellectual performance and pregnancy.

Studies conducted in 1979 on latex collectors in Indonesia and female tea collectors in Sri Lanka provide outstanding evidence of the direct relationship between haemoglobin levels and the ability to perform physical exercise [*5,6*]. The productivity of iron-deficient individuals was significantly less than that of workers with normal haemoglobin levels. After supplementation with iron, the performance of iron-deficient subjects improved most in those with the lowest initial haemoglobin levels [*6*]. Studies conducted by Viteri and Torus [*7*] indicate that even mild anaemia can decrease performance in exercise. Impaired work capacity results in adverse effects on productivity, earnings and the ability to care for children in the home.

Maternal anaemia results in intrauterine growth retardation, low birth weight, increased perinatal mortality and increased maternal morbidity and mortality. In developing countries, severe anaemia is the main causal factor in up to 20% of maternal deaths.

Morbidity from infectious diseases is increased in iron deficient populations because the immune system is affected adversely. Iron supplementation of deficient children and fortification of their milk or cereal reduces morbidity from infectious diseases [*8*].

Iron-deficient children are particularly vulnerable to lead poisoning, as lead has a high affinity for haemoglobin.

In 1991 WHO's Eastern Mediterranean Regional Office (EMRO) conducted an extended review of studies on the relationship between iron deficiency and mental performance in children in both developed and developing countries, which showed that anaemia is associated with less than optimal behaviour in infants and children. Iron deficient children scored lower on tests of development, cognition, learning and school achievement [*5*].

A WHO/UNICEF/UNU Consultation on Prevention of Iron Deficiency and Anaemia (Geneva, 1993) also reviewed the available evidence linking cognitive development and iron deficiency anaemia. The Consultation estimated on the basis of the available data an impairment of performance equivalent to 5–10 points deficiency in IQ [*8*].

Studies of infants in Chile, Costa Rica, Guatemala and Indonesia, and of preschool and school children in Egypt, India, Indonesia, Thailand and the USA have shown conclusively that iron deficiency anaemia delays psychomotor development and impairs cognitive development [*8*].

This negative impact is not likely to be reversed by subsequent iron therapy. The effects of iron deficiency anaemia in early childhood were observed in Egyptian children; children who suffered anaemia in childhood had lower IQ scores at school-entry than children who were formerly non-anaemic [*8*].

A recent study among Canadian children suggest that there is a negative impact on psychomotor development even when comparing non-anaemic iron deficient children and controls [*9*].

Since the technological advancement and economic development of a nation depend heavily on its trained human resources, the behavioural effects of anaemia are highly relevant. Consequently, if anaemia is highly prevalent in a country's children, it can substantially affect its intellectual and economical potential.

Strategies for the prevention and control of iron deficiency

The four basic approaches to the prevention of iron deficiency anaemia are 1) supplementation with medical iron, 2) dietary change and diversification to increase iron intake, 3) the control of infection through public health activities and 4) fortification of a suitable staple food with iron.

Supplementation

Providing iron tablets to a target population rapidly improves iron status. It is therefore the major short-term strategy for countries with a significant problem of iron deficiency anaemia. Currently supplementation is mostly employed for the treatment of iron deficiency anaemia; however, supplementation should be designed primarily as a preventive public measure.

The primary target groups for supplementation programmes in many countries are pregnant and lactating women, not only on account of the relative ease of reaching them but also because of the potential short- and long-term benefits for both mother and child. Iron supplementation for pregnant and lactating women should be national policy in countries with high iron deficiency prevalence.

In several countries supplementation programmes have had some positive impact in lowering iron deficiency in the target population [*8,22*]. However, it has often been difficult to organize large-scale supplementation programmes. Commonly identified constraints are low compliance, mainly due to the side-effects (nausea, melena) of most iron tablets, and lack of sufficient quantities of tablets.

Dietary modification

Food-based strategies constitute the most desirable and sustainable method for preventing micronutrient deficiencies.

Dietary iron intake can be increased in poor populations in two ways. The first is to ensure that people eat more of their habitual foods so that their energy needs are fully met. The drawback of this approach is the unchanged bioavailability of the dietary iron.

Another approach to dietary manipulation is to enhance the bioavailability of the iron ingested. There are a number of strategies available, all based either on promoting intake of iron absorption enhancers, such as citrus fruits, or on reducing the ingestion of absorption inhibitors, such as tannin and phytic acid.

A further strategy is to encourage the use of common household processing methods such as germination, malting and fermentation, which can enhance iron absorption by increasing vitamin C content and/or by lowering the tannin or phytic acid content. For example the malting of millet results in a 5–10 fold improvement in bioavailability.

Control of infections

Effective, timely curative care can diminish the adverse nutritional consequences of viral and bacterial disease. Curative services can reduce the duration and severity of infections and will consequently improve the iron status of individuals, even if there is no increase in dietary iron intake. Moreover, parasitic infections, such as hookworm and schistosomiasis infections, play a role in anaemia etiology. Deworming can be effective in decreasing the parasitic load, but should always be accompanied by efforts to eradicate the reservoir of infection.

Food fortification

The fortification of a widely consumed and centrally processed staple food with iron is one of the most effective ways of preventing iron deficiency. It can be targeted to reach some or all population groups, and does not necessarily require cooperation of the individual. The initial cost is modest, and recurring expenses are less than those of supplementation.

In estimating the effects of a iron fortification programme it is essential to learn about the main cause of the iron deficiency. If, for example, the main cause of the iron deficiency is a low intake of dietary iron, then one might expect that the fortification programme will be effective. If the main cause is poor bioavailability of iron, or heavy losses because of hookworm infestation, the effect will probably be low. In those cases, fortification should be combined with other preventive or curative measures.

Anaemia in the Eastern Mediterranean Region

Prevalence rates

Estimates of the extent of anaemia in women in the developing world are shown in Table 3. From these estimates prevalence rates in the Eastern Mediterranean Region appear to be moderate when compared with other developing regions. This is to some degree due to underreporting and a lack of sufficient nationwide data in the Region.

Only a few countries have up-to-date national data on anaemia. The data presented in the ICN country papers for the majority of countries are based on either regional data from limited samples or on surveys carried out in the mid 1980s or even before. Fortunately a number of countries are currently updating their data through national surveys of haemoglobin levels in (pregnant) women and/or preschool children.

A detailed review of anaemia in EMR Member States is given in Table 4. The review provides the most recent prevalence estimates and is based on published and unpublished documents, in particular country papers submitted to WHO for the International Conference on Nutrition in 1992 [*11–20*].

The prevalence of anaemia in women ranges from around 20% in Jordan, parts of Egypt and parts of Oman to more than 60% in Djibouti. For countries where anaemia in pregnant women was reported separately, prevalence ranges from around 20% in some parts of the United Arab Emirates, Saudi Arabia and the Islamic Republic of Iran, to more than 60% in other parts of the UAE. It seems from the available data that preschool children are more severely affected than women, with reported prevalence in many countries of more than 60%. This is also the

Table 3 **Prevalence of anaemia in women (15–49 years old) by region in the 1980s**

Region	Pregnant[a] Percent	Pregnant[a] Million[c]	Non pregnant[b] Percent	Non pregnant[b] Million[c]	All Percent	All Million[c]
Sub-Saharan Africa	50	6	40	35	42	41
Near East/North Africa	44	2	31	13	33	15
South Asia	64	19	64	139	64	158
South East Asia	56	8	47	49	48	57
China	34	11	26	64	26	75
Middle America/Caribbean	34	1	27	8	28	9
South America	31	3	41	320	42	370
Total (all regions above)	51	50	41	320	42	370

[a]*Proportion and numbers with haemoglobin below 11 g/dl*
[b]*Proportion and numbers with haemoglobin below 12 g/dl*
[c]*Numbers are based on population estimates for 1985 in developing countries*
Source: [10]

Table 4 **Anaemia prevalence in different population groups of the Eastern Mediterranean Region (%)**

Member State	Children Preschool	Children School age	Women Pregnant	Women Child-bearing age	Other (men)
Bahrain	34	32		40	20
Djibouti				63	
Egypt	75–90		21–35		
Iran	> 30		20–50		
Jordan				23.4	
Kuwait			40	42	34
Morocco	27–47		20		
Oman	60	78	54	15–48	3–24
Pakistan	65		45		
Palestine	58–76	40–67	23–44		
Saudi Arabia		[a]55.1	11–19		[b]30–56
Syria	53		49		
Tunisia	30				
UAE	28–76	8–95	22–62		
Yemen	17–66			5–36	

[a]*Girls (source: 24)* [b]*Overall country prevalence*
Sources: [11–20,24]

case in two countries that present data from national surveys: Oman and Pakistan. Only a few countries report data from school-age children; values range from 32% in Bahrain to 78% in Oman.

Based on the presently available regional and subregional data, an estimate was made of national anaemia prevalence levels (see Table 5) by using the epidemiological criteria presented in Table 2.

Causes of anaemia in the EMR

The total dietary iron intake in the Region is generally found to be below recommended intake levels. The overall per capita supply of iron appears to be static or perhaps decreasing in all developing regions except the Eastern Mediterranean Region (Fig. 3) [*10*]. However, these data are based on food-production information instead of food consumption surveys and should be interpreted with caution.

Dietary iron in the EMR (Fig 4) shows a great dominance of the low bioavailable non-haem iron (plant/vegetable), a pattern generally found in developing countries. Moreover, several national food surveys in the Region revealed diets with over 80% of the iron of non-haem origin (e.g., in Morocco, Tunisia, Islamic Republic of Iran) [*11*]. The findings in Kuwait are somewhat different [*14*]; 60% of the dietary iron is of non-haem origin. Results suggest that consumption of iron-rich food, especially of animal origin, is dependent on socioeconomic variables, explained by the higher costs of iron-rich foods. For example, from the Food Consumption Survey in Morocco [*11*], it appears that the degree to which dietary iron covers daily iron needs ranges from a minimum of 70% for the lowest income groups, to a maximum of 97% for the highest income groups. The generally observed lower haem iron intakes in rural areas compared to urban intakes, which was reported in Bahrain, Egypt, Jordan and Tunisia [*11,15,16*], may also be explained by the lower income of rural residents. It should however be noticed that even in the urban regions anaemia occurs on a moderate level.

In the EMR, the bioavailability of the ingested iron is further lowered due to the high consumption of foods rich in iron absorption inhibiting factors, such as tea (tannin) and unleavened bread (phytate). Tea is one of the most frequently consumed beverages in most countries in the Region, and drinking tea has an important social function in daily life. It appears that even infants consume a high quantity of tea, as a supplement to breast-feeding [*11,15*].

Fruits and vegetables, enhancing iron bioavailability by their vitamin C content, are sometimes consumed in rather large quantities (e.g., in Morocco [*11*]), but vitamin C intake is largely seasonal, and a sufficient

Table 5 **Anaemia prevalence by level and vulnerable groups in selected Members of the Eastern Mediterranean Region**

Member State	Level[a]	Recognized vulnerable groups[b]	Year[c]
Bahrain	Moderate	Children, women (men)	1980
Djibouti	Severe	Women	1990
Egypt	Moderate to severe	Women, children	1980
Iran	Moderate to severe	Children, pregnant women	–
Jordan	Moderate	Pregnant women	1991
Kuwait	Severe	All women	1990
	Moderate	Men	1985
Morocco	Moderate	Women, preschool children	1984
Oman	Moderate	Women, men	1991
	Severe	Preschool children	1992
Pakistan	Severe	Women, preschool children	1987
Palestine	Severe	Pregnant women, third trimester, children	1990
	Moderate	Other women	1990
Saudi Arabia	Moderate to severe	General	1991
Syria	Severe	Pregnant women, preschool children	1982
Tunisia	Moderate	General	1975
UAE	Moderate to severe	General	1980
Yemen	Moderate	Urban women and children	1979
	Severe	Rural women and children	1979

[a]Level of anaemia prevalence: mild 1–9%, moderate 10–39%, severe > 40% (see Table 2)
[b]Physiological groups in which studies recognized anaemia being a significant health problem. This does not necessarily mean that anaemia is not prevalent in other physiological groups in the countries concerned
[c]Year of data on which the prevalence level is based

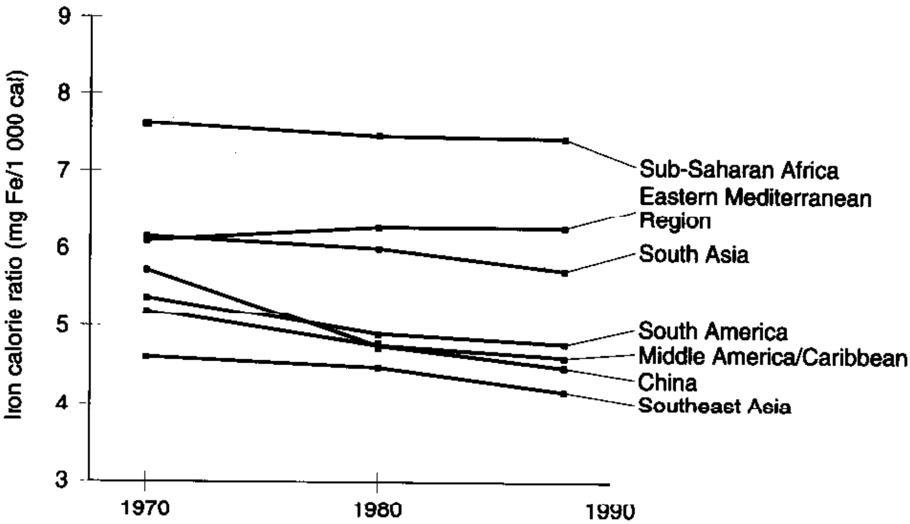

Figure 3 **Iron density in the diet 1970–1988 (mg iron per 1 000 calories)** *Source: [10]*

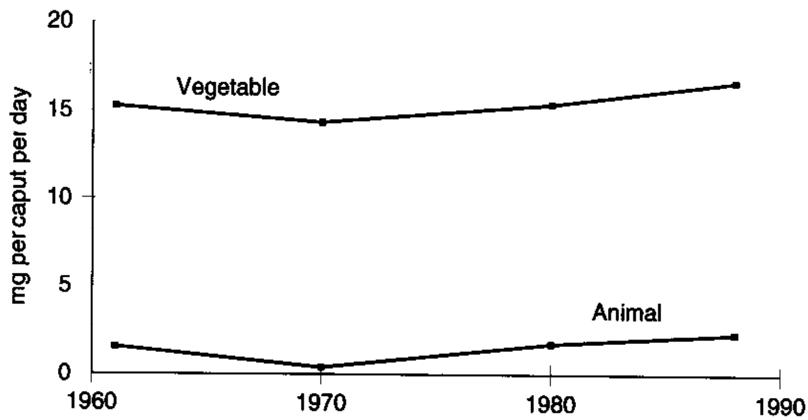

Figure 4 **Dietary iron supply 1961–1989 (mg iron per caput per day)** *Source: [10]*

amount must be provided for the enhancing effect to be produced [7].

In addition to dietary factors, childbearing patterns and parasitic infections may play a role in anaemia in the EMR. High birth rates and short birth intervals are a common characteristic of socioeconomically less advantaged populations. The degree of parasitic infections in a population is related to hygiene and access to Primary Health Care (PHC), and as such is also dependent on socioeconomic conditions, which can vary broadly within and across countries.

The importance of genetic factors, such as thalassaemia, remains unclear. In a study on anaemia among Saudi bedouin children [*21*] it was suggested that an important fraction of anaemia cases may be explained by the presence of α-thalassaemia. However, more research should be done before conclusions can be made.

Regional programmes for control and evaluation of their efficacy

Programmes on preventing anaemia in the EMR exist but their scope and impact have been limited thus far. Several countries report the distribution of iron/folate tablets by maternal and child health centres, but well-defined programmes and evaluations are often missing.

1. Protocol for prevention of anaemia in pregnancy—desk studies

In the context of the broadened international emphasis on elimination of micronutrient deficiencies, WHO and UNICEF drew up in early 1993 a "Protocol for Prevention of Anaemia in Pregnancy". The protocol is an effort to accelerate action on anaemia prevention and formulates a proposal for review of national anaemia prevention programmes. Initially 30 countries in the five Regions of WHO were contacted by sending the protocol document to national governments. In the Eastern Mediterranean Region, the protocol was sent to all countries, and as of March 1995 eight countries have carried out the first phase of the protocol, a desk study of national available information, existing anaemia prevention programmes and evaluation and research activities.

The results of these desk studies show that in most countries, anaemia control has an informal character. Activities are carried out without any formal programme policy.

In the Islamic Republic of Iran, a formal anaemia prevention programme exists that focuses on routine supplementation through the PHC system, linked also with malaria prophylaxis and deworming. Supplementation is preventive.

In Oman, a national nutritional anaemia programme provides iron supplementation through antenatal clinics.

The countries that carried out the desk study reported problems in obtaining sufficient supplies of iron tablets to cover the target group. In one case, the supplies were less than 10% of those needed to even cover all anaemic pregnant women, let alone routine supplementation of all pregnant women. In another case, one half tablet is available per pregnant woman per year.

2. UNRWA Evaluation of Anaemia Prevention Programme

In 1993 UNRWA conducted a survey in West Bank refugee camps in order to assess and evaluate anaemia prevalence and prevention [*22*].

The objectives of the study were, apart from determination of the prevalence and severity of iron deficiency in pregnant women, to assess the success of attempts to raise the women's iron reserves at time of delivery and to determine compliance of UNRWA's medical personnel with the technical iron deficiency prevention guidelines [*22*].

A sample of 539 antenatal records was taken from 1 821 women who attended antenatal services at UNRWA health units in five West Bank refugee camps. It appeared that 97% of all newly registered pregnant women were screened via haemoglobin examination. Approximately 30% of women tested at time of registration failed to return during the third trimester of pregnancy. From the anaemic women who did come back in the third trimester, the majority had increased iron reserves. It was assumed that the six women who did not improve at all failed to take the prescribed tablets; gastric discomfort was regularly reported by patients who did take the iron.

It was noted in the study that women did not usually come for antenatal care until well into their second trimester. If women would come for care earlier in their pregnancy, supplementation could start sooner for better prevention of anaemia.

It was suggested that health centre staff should visit at home those women who fail to return for their antenatal visit, to provide them with tablets and encourage them to have their haemoglobin checked. More research is needed to study the women's perceptions and attitudes towards antenatal services.

3. Evaluation of nutritional anaemia programme in the Sultanate of Oman

In 1992, WHO/EMRO and the Ministry of Health of Oman jointly carried out an evaluation of the Nutritional Anaemia Programme in the Sultanate of Oman [*23*]. The study was funded by the Safe Motherhood Programme of WHO. The national nutritional anaemia control programme, which has been operational for several decades, is implemented through the antenatal care services of hospitals and health centres of the Ministry of Health. The beneficiaries are pregnant women who are given iron, folate and/or multivitamin tablets.

Supplementation was found to be almost universal (97%) but compliance was only 77%. The main three reasons for noncompliance were side-effects, forgetfulness and "wrong belief" [*23*].

Less than half of the women knew what type of tablet they were taking.

The evaluators stressed the need for streamlining by standardizing the programme for definition of anaemia and using only one type of tablet with specified duration and dose of supplementation. Continuing training was strongly advocated in the report, as well as the introduction of a programme monitoring system.

Conclusion—a need for action

The existence of anaemia in the EMR has been recognized for a long time, and numerous surveys in the past 30 years have confirmed the high prevalence rates for women and children.

Despite intervention activities, iron/folate supplementation or small scale fortification activities, no real improvements have been achieved to date.

It may be concluded from the present paper that well-organized and efficient anaemia prevention programmes are generally missing in the Eastern Mediterranean Region.

During the ICN, all Eastern Mediterranean Region Member States committed themselves to action to achieve the goal of reduction by one third of 1990 levels of anaemia in women of childbearing age.

Recently the Subcommittee of Nutrition of the Administrative Committee on Coordination of the United Nations (ACC/SCN), in which all agencies are represented, called for a mid decade goal for anaemia, in the view of its deleterious impact on the health and development of women and children. The disastrous effect of iron deficiency anaemia on the intellect and behaviour of children, an effect which seems to last far beyond the anaemic period itself, is by now well-known.

The situation gets even more threatening now that new evidence suggests that iron deficiency before even clinical anaemia is present seriously affects psychomotor development.

A loss of intelligence of 5–10 IQ points will have grave consequences for the countries of the Region, all of which are still faced with the problem of anaemia, let alone subclinical iron deficiency.

In addition to the effects of iron deficiency alone, there is need for additional concern as iron deficient children are particularly vulnerable to lead poisoning, as lead has a high affinity for haemoglobin. In the Eastern Mediterranean Region, lead is a major component of the pollution choking the megacities. Preventing iron deficiency will give at least some protection to the Region's children against lead poisoning.

All of the above illustrate the need for urgent action based on the following five action points:

1. All countries in the Region that have not yet done so are urged to conduct immediately a rapid situation analysis using the desk-study protocol available from WHO/EMRO. This situation analysis should also address the reasons behind the failure of current anaemia control activities.
2. All countries should improve their present, often ad hoc, supplementation programmes. Iron tablets in sufficient quantities should be given to all pregnant women as a preventive measure. Health staff need to be trained to promote compliance with this preventive approach and to identify women who need treatment.

   Interesting new developments have recently been reported suggesting that weekly supplements of iron tablets are as effective as daily supplements for the prevention of iron deficiency anaemia. This would reduce the burden on countries, on health staff and last but not least on the target group (Nevin Scrimshaw, Serge Hercberg, personal communications, early 1995).

   Supplementation with iron tablets alone is however not enough to address the problem. The supplementation programme must go hand in hand with further action.
3. There is a need to educate the public on ways to enhance their dietary iron intake and bioavailability. Simple changes can yield great benefits; e.g., to drink tea only before or well after a meal and to consume fruit or drink fruit juices during the meal.

   Bread that has been fermented with yeast has more available iron that the flat, unleavened bread usually consumed. Consumption of even small quantities of animal food, such as meat, will also enhance the absorption of iron from non-animal sources.

   Schools are an excellent environment for advocacy and for these behavioural changes, and countries should integrate iron deficiency anaemia control into their school health programmes.
4. In the long term, fortification of a variety of foods with iron will be needed to increase the iron intake of the population. In Europe and the US, cereals and ready-to-eat cereal-based foods such as cornflakes are routinely fortified with iron. Milk is also fortified in certain countries. In many countries in the EMR, bread can fairly easily be fortified.

   In addition, there is great scope for innovative approaches in fortification, whereby countries can identify specific, commonly consumed foods and condiments that are centrally processed.
5. All countries should address the environmental and other factors identified as contributing to iron deficiency in their population.

   Measures could range from control of parasitic infections and routine deworming of school children, to promotion of breast-feeding and appropriate complementary feeding to the promotion of family planning for health.

Only by concerted action such as described above, will it be possible to seriously reduce the enormous burden of iron deficiency and anaemia.

References

1. National Strategies for Overcoming Micronutrient Malnutrition. Agenda item 21, 45th World Health Assembly, World Health Organization, 1992 (unpublished).
2. *The prevalence of anaemia in women: a tabulation of available information.* Geneva, World Health Organization, 1992 (document WHO/MCH/MSM/92.2).
3. *Nutritional anaemias.* Report of a WHO Scientific Group. Geneva, World Health Organization, 1968 (WHO Technical Report Series, No. 405).
4. DeMaeyer EM et al. *Preventing and controlling iron deficiency anaemia through primary health care.* Geneva, World Health Organization, 1989.
5. *Iron deficiency and behavioural patterns in children.* Alexandria, Egypt, World Health Organization Regional Office for the Eastern Mediterranean, 1991 (unpublished position paper).
6. Brown ML, ed. *Present knowledge in nutrition*, 6th ed. Washington DC, International Life Science Institute-Nutrition Foundations, 1990.
7. Hercberg S. Iron and folate-deficiency anaemias. *Children in the Tropics.* The journal of the International Children's Centre, Paris. 1990, No. 186.
8. WHO/UNICEF/UNU. *Prevention of iron deficiency.* Report of a consultation. Geneva, World Health Organization (in press).
9. Moffat MEK et al. Prevention of iron deficiency and psychomotor decline in high risk infants through use of iron-fortified infant formula: a randomized clinical trial. *Journal of Paediatrics*, October 1994.
10. *Second report on the world nutrition situation*, vol. 1. Geneva, Subcommittee of Nutrition of the Administrative Committee on Coordination of the United Nations (ACC/SCN), 1992.
11. *Country papers submitted to the International Conference on Nutrition (all unpublished):*

    Government of Cyprus. Cyprus Country Paper submitted to the International Conference on Nutrition. 1992.

    Ministry of Public Health Djibouti. Rapport national soumis à la CIN. 1992.

    Government of Egypt. Egypt Country Paper submitted to the ICN: nutrition status in Egypt. Cairo, Nutrition Institute, 1991.

    Ministry of Health and Medical Education, Islamic Republic of Iran. Country Paper submitted to the ICN. 1992.

    Ministry of Public Health Morocco. Maroc rapport national soumis à la CIN. 1992.

    Ministry of Health Oman. Oman Country Paper submitted to the ICN. 1992.

    Ministry of Health, Kingdom of Saudi Arabia. Saudi Arabia Country Paper submitted to the ICN 1992. 1991.

    State Planning Commission of Syria. Syrian Arab Republic Country Paper submitted to the ICN. 1992.

    Ministry of Public Health of Tunisia. Tunisie rapport national soumis à la CIN. 1992.

    Ministry of Planning and Development of the Republic of Yemen. Yemen Country Paper submitted to the ICN. 1992.
12. Al-Mousa Z. *Nutrition and health in Kuwait.* Paper submitted to "Intercountry consultation on malnutrition of affluence". Alexandria, Egypt, World Health Organization Regional Office for the Eastern Mediterranean, 1989 (unpublished).
13. Cook R. The evolution of the food and nutrition problems in Palestine refugees. *Journal of Refugee Studies*, 1992, 5:271–288.

14. Dawood JA et al. Iron deficiency anaemia among pregnant Arab women in Kuwait. *Journal of the Kuwait Medical Association*, 1990, 24(2):167–172.

15. Jilani I et al. *A study among pregnants at MCH-centres in Jordan for the year 1990 and the first half of 1991*. Amman, Jordan, Ministry of Health, 1991.

16. *Assessment of the nutritional status of pre-school children in Jordan*. Amman, Jordan, Ministry of Health, 1991 (unpublished).

17. Musaiger AO. *The state of food and nutrition in Bahrain*. Riyadh, Saudi Arabia, UNICEF Gulf Area Office, 1993.

18. *Nutrition status in Syria*. Damascus, Syrian Arab Republic, Ministry of Health, 1990 (unpublished).

19. Osman AK. *United Arab nutrition survey*. Abu Dhabi, UNICEF Gulf Area Office, 1981.

20. *Pakistan national nutrition survey 1985–1987*. Islamabad, Pakistan, National Institute of Health, 1988.

21. Stevens DW et al. The pathogenesis of hypochromic anaemia in Saudi infants. *Journal of Tropical Paediatrics*, 1989, 35:301–305.

22. *Survey of iron deficiency anaemia among pregnant women in West Bank refugee camps*. Jerusalem, UNWRA Expanded Maternal Health Project, 1993 (unpublished).

23. *Evaluation of nutritional anaemia control programme in the Sultanate of Oman*. Alexandria, Egypt, World Health Organization Regional Office for the Eastern Mediterranean, WHO/EMRO report, 1992 (document EM/NUT/113/E/R/03.92).

24. Al-Othmaneen AI, Osman AK. *Assessment of nutritional status of school children and survey of school meals in Riyadh city*. Draft UNICEF report.