

SEA-CAH-02

PREVENTION OF IRON DEFICIENCY ANAEMIA IN ADOLESCENTS

ROLE OF WEEKLY IRON AND FOLIC ACID SUPPLEMENTATION

CONTENTS

Foreword.....	V
Abbreviations	VI
Section I Iron Deficiency Anaemia in Adolescents and Evidence of Weekly Iron and Folic acid Supplementation	
Background	2
Iron deficiency and iron deficiency anaemia (IDA) in adolescence.....	2
Staggering Numbers: Prevalence of anaemia among adolescents in SEAR.....	7
What would it take to fight iron deficiency and IDA among adolescent girls more effectively?.....	8
Weekly Iron-Folic Acid Supplementation (WIFS) - A Proven Effective Preventive Measure.....	10
Moving ahead towards an effective implementation of WIFS programme for adolescents.....	15
Section II Country Factsheets on Adolescent Anaemia	
Bangladesh	27
Bhutan	33
DPR Korea	37
India	41
Indonesia	49
Maldives	57
Myanmar	61
Nepal	67
Sri Lanka	75
Thailand	83
Timor-Leste	91

© World Health Organization 2011

All rights reserved.

Requests for publications, or for permission to reproduce or translate WHO publications - whether for sale or for noncommercial distribution - can be obtained from Publishing and Sales, World Health Organization, Regional Office for South-East Asia, Indraprastha Estate, Mahatma Gandhi Marg, New Delhi-110 002, India (fax: + 91-11-23370197; e-mail: publications@searo.who.int).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

This publication does not necessarily represent the decisions or policies of the World Health Organization.

Printed in India

Foreword



Adolescence is marked by a rapid phase of growth and development during which the requirement of nutrition and micronutrients is relatively high. Therefore, adolescents, especially girls, are vulnerable to iron deficiency. The highest prevalence is between the ages of 12-15 years when requirements are at a peak. In all Member States of the South-East Asia Region, except Thailand, more than 25% of adolescent girls are reported to be anaemic, in some countries the prevalence is as high as 50%.

Interventions to prevent and correct iron deficiency anaemia must include measures to increase iron intake through food-based approaches, namely dietary diversification and food fortification with iron; iron supplementation and by improved health services and sanitation. In countries where anaemia prevalence exceeds 40% in pregnant women, universal iron supplements for adolescent girls (particularly those aged 12 to 16 years) and women of childbearing age is necessary. Adherence to the daily regime, however, is frequently poor. In view of this, weekly administration of iron-folic acid supplementation (WIFS) has been successfully tried as a public health approach in several countries.

I am sure that the Member States would like to consider the evidence on weekly iron-folic acid supplementation from a number of developing countries presented in this document to formulate policy on management of iron deficiency anaemia in adolescents. Reduction in prevalence of anaemia among adolescents would help improve the physical and intellectual potential as well as the health of this important section of the population.

A handwritten signature in black ink that reads "Samlee Plianbangchang".

Dr Samlee Plianbangchang
Regional Director

Abbreviations

TIBC	Total Iron Binding capacity
TS	Transferrin Saturation
Hb	Haemoglobin
IDA	Iron Deficiency Anaemia
ID	Iron Deficiency
LBW	Low Birth Weight
RDA	Recommended Dietary Allowances
WIFS	Weekly Iron Folic Acid Supplement
FLEd	Family Life Education
NSGG	Non School Going Girls
SGG	School Going Girls
IFA	Iron and Folic Acid
MDG	Millennium Development Goal
MMR	Maternal Mortality Rate
IMR	Infant Mortality Rate
U5MR	Under Five Mortality Rate

SECTION 1

Iron Deficiency Anaemia in Adolescents and Evidence of Weekly Iron and Folic acid Supplementation

1. **Background**
2. **Iron deficiency and iron deficiency anaemia (IDA) in adolescence**
3. **Staggering numbers: Prevalence of anaemia among adolescents in SEAR**
4. **What would it take to fight iron deficiency and IDA among adolescent girls more effectively?**
5. **Weekly Iron-Folic Acid Supplementation (WIFS) - A proven effective preventive measure**
6. **Moving ahead towards an effective implementation of WIFS programme for adolescents**

1. Background

Anaemia is currently one of the most common and intractable nutritional problems globally. It is a global public health problem that affects both developing and developed countries with major consequences for human health as well as social and economic development. WHO estimates the number of anaemic people worldwide to be a staggering two billion with approximately 50% of all anaemia attributable to iron deficiency¹. Iron deficiency anaemia occurs at all stages of the life cycle, but is more prevalent in pregnant women and young children. Adolescents, particularly girls, are vulnerable to iron deficiency. The World Health Report² (2002) identified iron deficiency among the 10 most serious risks in countries with high infant mortality coupled with high adult mortality and reported that measures to address iron deficiency anaemia are among the most cost effective public health interventions².

2. Iron deficiency and iron deficiency anaemia (IDA) in adolescence

In most populations anaemia is primarily due to iron deficiency and is in fact the late stage of a relatively long process of deterioration in iron stores. UNICEF/UNU/WHO/MI report indicates that there are approximately 2.5 cases of iron deficiency for each case of anaemia. The functional consequences are known to occur prior to onset of clinical stage of iron deficiency³. Many more adolescents are in fact suffering from iron deficiency (ID) with its adverse effects on health and physical stamina, than are frankly anaemic. Iron deficiency and iron deficiency anaemia (IDA) in adolescence is a major public health problem. Studies indicate that the incidence of anaemia in adolescents tends to increase with age and corresponds with the highest acceleration of growth during adolescence. The highest prevalence is between the ages of 12-15 years when requirements are at peak. More than 50% girls in this age group have been reported to be anaemic.^{4,5,6,7}

Why are adolescents at a greater risk?

Adolescents (age 10-19 years) are at high risk of iron deficiency and anaemia due to accelerated increase in requirements for iron, poor dietary intake of iron, high rate of infection and worm infestation as well as the social norm of early marriage and adolescent pregnancy.

a) Accelerated increase in requirements for iron

Iron requirement peaks during adolescence due to rapid pubertal growth with sharp increase in lean body mass, blood volume and red cell mass, which increases iron needs for myoglobin in muscles and haemoglobin in the blood. The continuous increase in the median requirements for absorbed iron for both boys and girls

during adolescence peaks between the ages of 14-15 years for girls and one to two years later for boys⁸. The requirement for iron in fact doubles during adolescence as compared to younger age group (table-1). The overall iron requirement increases two to three folds from a preadolescent level of approximately 0.7-0.9 mg iron per day to as much as 1.37-1.88 mg per day in adolescent boys and 1.40-3.27 in adolescent girls.⁸ Additional iron is therefore required by both adolescent boys and girls for the expanding red cell mass and growing body tissue.

After sexual maturation, there is a rapid decrease in growth spurt and need for iron. As a result, there is an opportunity to recover from an iron deficiency that might have developed during this peak growth especially for boys. In girls, however, the growth spurt is not as great, but menstruation typically starts about one year after peak growth and requirements for iron remain high through the reproductive life to replace iron that is lost during menstruation. There is a regular loss of 12.5-15 mg iron per month or 0.4-0.5 mg iron per day in menstrual blood. Therefore in girls, following the growth spurt, the risk of iron deficiency continues to be a public health concern through the entire reproductive age but this risk subsides for boys after completion of pubertal growth spurt.¹⁰

Table 1: Iron intakes required for adolescent boys and girls⁹

Group	Age	Body weight	Required Iron intakes for Growth	Basal Iron losses	Menstrual losses		Total Absolute Requirements †	
		Mean		Median	Median	95 th percentile	Median	95 th percentile
	(Years)	(kg)	(mg/day)	(mg/day)	(mg/day)	(mg/day)	(mg/day)	(mg/day)
Children	0.5-1	9	0.55	0.17			0.72	0.93
	1-3	13.3	0.27	0.19			0.46	0.58
	4-6	19.2	0.23	0.27			0.50	0.63
	7-10	28.1	0.32	0.39			0.71	0.89
Males	11-14	45	0.55	0.62			1.17	1.46
	15-17	64.4	0.60	0.90			1.50	1.88
	18+	75		1.05			1.05	1.37
Females	11-14 ^b	46.1	0.55	0.65			1.20	1.40
	11-14	46.1	0.55	0.65	0.48 ^c	1.90 ^c	1.68	3.27
	15-17	56.4	0.35	0.79	0.48 ^c	1.90 ^c	1.62	3.10
	18+	62		0.87	0.48 ^c	1.90 ^c	1.46	2.94

† Total Absolute Requirements = Requirement for growth + basal losses + menstrual losses (females only)

^bNon - menstruating.

^cEffect of the normal variation in haemoglobin concentration not included in this figure.

b) Low dietary intake by adolescents and bio-availability of iron

Another cause of IDA in adolescence is low dietary intake and poor bioavailability of iron consumed against the significant increase in requirements¹¹. The data from India indicates that the diets of girls aged between 13-18 years provide much lower level of iron than the diets of boys in the same age group¹². Low consumption of nutrients by adolescents reported from India indicates that over 50% adolescent girls consumed less than 50% RDA for energy while over 70% girls consumed less than 50% RDA of iron.¹³ Similarly, Bangladesh study on adolescent girls attending schools in Dhaka city¹⁴ reveals that 31% of these girls consumed less than 50% RDA for iron and 10% less than 50% RDA for energy.

There is also a tendency among adolescents to frequently consume snacks prepared from refined cereals as well as a habit to consume carbonated drinks while there is a lower inclination to eat fruits and vegetables. Moreover, habitual consumption of tea/coffee immediately after meals by adolescent girls also contributes to higher prevalence of anaemia of 50% as compared to 34% in those who did not consume tea/coffee after meals¹⁵. Although the iron density in the diets of both boys and girls is similar, the lower total food intake or energy intake by adolescent girls compared to boys, combined with menstrual losses cause adolescent girls to be at greater risk of Iron deficiency and IDA¹⁶. Social discrimination towards the girl child as well as dieting play a crucial role in worsening the quality and quantity of diet and dietary iron consumed by adolescents.

In South-east Asia region, the low iron intake is further worsened by the fact that the bioavailability of iron consumed is low since the diet is primarily cereal-based with little meat or vegetables. Such diet has high concentration of inhibitors and low concentration of enhancers and lowers the bio-availability of dietary iron. This is evident from data for India—the prevalence of anaemia is higher in Indian adolescents consuming a vegetarian diet (45.8%) as compared to those consuming a mixed diet, which includes animal food (30%).

c) Adolescent pregnancy

Added to the problem of poor dietary iron intake is the traditional practice of early marriage in many countries of the SEA Region (table-2). Social pressure often results in not delaying the first pregnancy and majority of young married women conceive soon after marriage.¹⁷ Onset of pregnancy during adolescence further increases demands for iron and contributes to aggravating iron deficiency and IDA. In India 47% of girls and in Bangladesh and Nepal over 50% girls are married by the time they are 18 years of age. In Indonesia, Thailand and Sri Lanka, 22%, 19.7% and 10% girls respectively are married by 18^{16,18-22}. Early marriage is frequently associated with early pregnancy. Studies on adolescent pregnant girls in Nepal and tribal India indicate that risks and outcomes of pregnancy increases in adolescent mothers who have higher prevalence of anaemia.^{23,24}

Table 2: Percentage of women aged 20-24 married by age 15 and 18 in selected countries of South-East Asia Region

Country	By age 15 (%)	By age 18 (%)
Bangladesh (2007)	32.3	66.2
India (2005-2006)	18.2	47.4
Indonesia (2007)	4.3	22.0
Nepal (2005)	14.1	56.1
Sri Lanka (2000)	1.5	10
Thailand (2005-06)	2.3	19.7
Timor Leste (2003)	7.6	34.2

Source: DHSs and Thailand MICS 2005-06

d) Frequent infectious diseases and parasitic infections

The frequent occurrence of infectious diseases and parasitic infestation among developing countries further increases requirements for iron and increases the chances of negative iron status and IDA. In a study in India, one third of adolescents had a history of infestation.²⁵ The prevalence of anaemia was double in these girls (53.6%) compared to those who were not reported to be infected (25%). Infections interfere with food intake, absorption, storage and use of many nutrients such as iron, vitamin B₁₂, folic acid, vitamin C, vitamin A etc which contribute to anaemia.

Consequences of iron deficiency

Iron deficiency adversely affects^{10, 26, 27, 28, 29}

- ♦ attentiveness, memory and school performance of adolescents, their school attendance and retention
- ♦ physical growth and onset of menarche
- ♦ immune status and morbidity from infections
- ♦ physical capacity and work performance.

Specifically iron deficiency anaemia during pregnancy^{30, 31, 32, 33, 34, 35}:

- ♦ increases fetal morbidity and mortality
- ♦ increases perinatal risks for mothers and neonates, incidence of low birth weight (LBW)
- ♦ increases overall infant mortality

It is recognized that even before appearance of anaemia mild to moderate iron deficiency is associated with adverse functional consequences.

Research has shown that the risk of LBW, preterm delivery and perinatal mortality increases among iron deficient anaemic adolescents. As growing pregnant adolescents compete with the growing foetus for the nutrients and also they often receive inadequate antenatal care, their anaemia during labour and postpartum period may be worse than in older women. Severe anaemia is an important cause of maternal mortality among adolescents.

National socio-economic development, as well as personal health and self-fulfilment, are impaired by iron deficiency. The negative impact on national development can be estimated from:³⁶

- ♦ The number of individuals affected in various age and gender categories
- ♦ The severity of deficiency
- ♦ Duration and consequences of the condition.

The economic implications of such conditions include³⁶:

- ♦ The cost incurred by the public and private sectors in therapeutic measures for the prevalent level of anaemia;
- ♦ The societal consequences of increased maternal mortality and resultant restraints on productivity; and
- ♦ The long term projected negative consequences of impaired mental development on human capital formation.

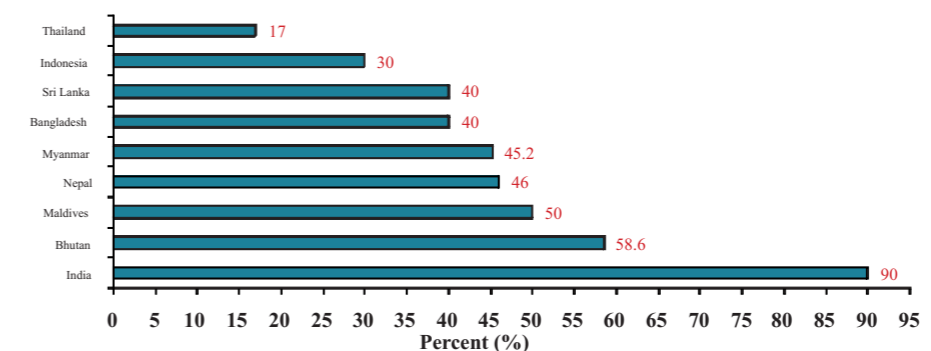
The economic costs of IDA have been estimated at 4.05% of gross domestic product (GDP)—US\$2.32 per capita in lost productivity and US\$14.46 per capita in lost cognitive function (IDA reduces IQ by half a standard deviation). Worldwide, \$50 billion in GDP is lost annually in low-estimates of economic losses from Iron Deficiency Anaemia (Cognitive & Productive) as percentage of GDP income countries due to IDA's effect on productivity³⁷.

Anaemia amongst adolescents would have further impact on the not too distant GDP of any nation as they are on the verge of becoming its immediate workforce.

3. Staggering numbers: high prevalence of anaemia among adolescents in SEAR

Adolescents, between the ages of 10-19 years³⁸, constitute about 20% of the population in South-East Asian countries. While national data on anaemia among adolescent girls for all the countries of the Region are not available, data from studies, (fig. 1) shows that in all South - East Asian countries, except Thailand, more than a quarter of girls are anaemic, though there is a great disparity within the Region. Irrespective of severity, the anaemia prevalence among adolescent girls ranges between 17%-90% within the Region. The National data from India, Nepal and Myanmar also show that adolescent anaemia is a moderate to severe public health problem (fig.2).

Figure1: Anaemia prevalence in adolescent girls (data reported by studies)³⁹⁻⁴⁹



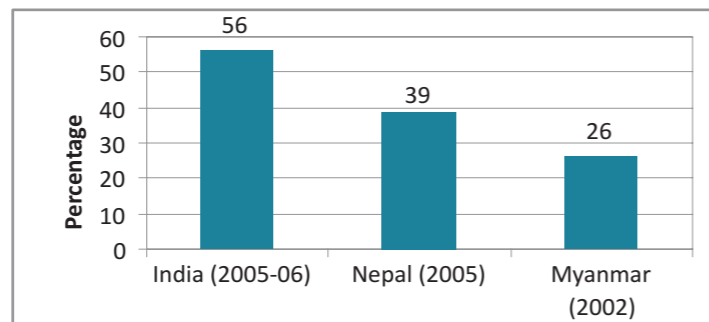
According to WHO guidelines, there are almost no countries in the Region where anaemia is not at least a mild public health problem in the female adolescent population (box).

Classification of anaemia as a problem of public health significance

Prevalence of anaemia (%)	Health significance
≤4.9	No public health problem
5.0–19.9	Mild public health problem
20.0–39.9	Moderate public health problem
≥40.0	Severe public health problem

Source: Worldwide prevalence of anaemia 1993–2005: WHO global database on anaemia / Edited by Bruno de Benoist, Erin McLean, Ines Egli and Mary Cogswell.

Figure 2: DHS and National Survey data on prevalence of anaemia among adolescent girls



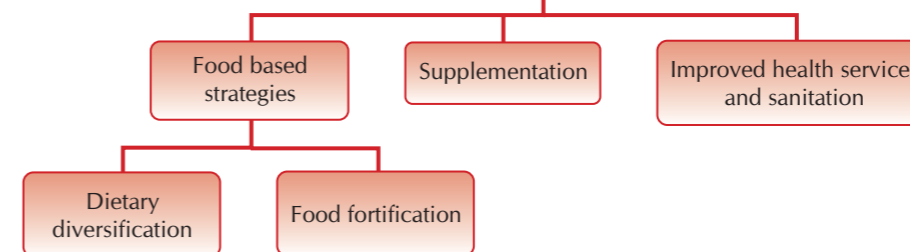
4. What would it take to fight iron deficiency and IDA among adolescents more effectively?

Anaemia is a multi-factorial disorder that requires a multi-pronged approach for its prevention and treatment. Iron deficiency and infections are the most prevalent etiological factors. However, other conditions may have a contributory role. The Copenhagen Consensus panel (2004) of eminent economists concluded that the returns of investing in micronutrient programmes (including iron), among a list of 17 possible development investments, are second only to those of fighting HIV/AIDS. The benefit-to-cost ratio of iron interventions based on resource savings, improvement in cognitive development and schooling, and physical productivity was estimated to be as high as 200:1⁵⁰.

Adolescence is an opportune time for interventions to address anaemia. Not only is there a need (growth, preparation for pregnancy), but large numbers of both boys and girls can be reached easily if school attendance or participation in other group activities is high. Also, adolescents are open to new information and new practices since they are often striving for physical or academic excellence.

Strategic focus on prevention of IDA among adolescents is more important from the point of view of productivity gains from improved physical capacity; productivity gains from increased cognitive ability; and (for adolescent girls) improved pregnancy outcomes and intergenerational benefits.

Strategies for prevention and control of iron deficiency and IDA



Source: Iron deficiency anaemia: assessment, prevention and control. A guide for programme managers; WHO 2001-WHO/NHD/01.3

Prevention of both iron deficiency and anaemia require approaches that address all the potential causative factors. Interventions to prevent and correct iron deficiency and IDA therefore must include measures to increase iron intake through food based approaches, namely dietary diversification and food fortification with iron; iron supplementation and by improved health services and sanitation.

Food based approaches

Food-based approaches to increase iron intake through food fortification and dietary diversification are important sustainable strategies for preventing iron deficiency and IDA in the general population. However, it is not easy to change food habits or ensure access to iron rich foods since diets in SEAR countries are primarily cereal based and bioavailability of iron from such diets is limited. On the other hand, iron from dietary animal source (heme iron) is better in terms of bioavailability but consumption is rather low or nil due to social reasons and poverty.

Iron supplementation

Since it is difficult to influence dietary behaviour due to social reasons and poverty, it is proposed jointly by UNICEF/UNU/WHO/MI³ that in countries where anaemia prevalence exceeds 40% in pregnant women, provision of universal iron supplements for adolescent girls (at a minimum for those aged 12 to 16 years) and women of child bearing age is necessary. Iron-folic acid supplements are cost-effective and positive results are evident in a short period of a few months.

It has been suggested that adolescence may be an optimal time to deliver iron supplements to build iron stores in the body before pregnancy. Physiologic needs are high at this stage of life because of increased requirements. Since menarche often sets in by 12 years of age, it is critical to ensure that

adolescents regularly consume iron-folic acid tablets to prevent iron deficiency anaemia. Intervention to address anaemia at a younger age, 10-14 years, as compared to 15-18 years has been demonstrated to give a better response in weight gain and body mass index (BMI)⁵¹ and in regularization of the menstrual cycle⁵².

More than 40 years of iron supplementation programmes aimed at controlling gestational anaemia have been ineffective in several countries. Adherence to the daily regime, however, is frequently poor for a variety of reasons, including the unpleasant symptoms of nausea, black feces, and a medicinal iron aftertaste, as well as defects in delivery through the health system, especially in less-developed countries.

5. Weekly Iron-Folic Acid Supplementation (WIFS) – An effective measure for prevention and management of iron deficiency anaemia

Weekly iron-folic acid supplementation (WIFS) and not daily supplements is proposed as a preventive long term approach to improve iron status and also for reducing the prevalence of anaemia⁵³. The daily oral administrations of iron doses far exceed the capacity of an individual to assimilate (absorb, utilize, and metabolize) iron safely. The positive impact of WIFS reported in various studies support the “mucosal block” hypothesis, wherein administration of iron every seven days allow time for shedding of cells loaded with iron from a previous dose, thereby increasing iron absorption^{54,55}.

Weekly supplementation:

- ✓ is a more efficacious and effective preventive approach in public health programs
- ✓ is cost effective
- ✓ results in fewer side effects
- ✓ is operationally easier to manage at the community level.

In 1999, meta-analysis was undertaken⁵⁶ to review the efficacy of intermittent iron supplementation for the control of iron deficiency anaemia in developing countries. The analysis was based on the results of a total of 22 completed trials of iron supplementation, including nine studies with adolescent groups (Table 3). The results indicated a positive impact with weekly supplements in five of the nine studies. The meta-analysis concluded that “it appears under highly controlled conditions, supplementation can have an impact on anaemia prevalence and that the daily and weekly approaches may have similar impact”. Based on this conclusion, weekly supplementation with iron-folic acid was recommended only in situations where there is a strong assurance of supervision and high compliance.

Table 3: Efficacy of daily and weekly iron folic acid supplementation in various countries – meta analysis study⁵⁶

Countries		% Prevalence of Anaemia **		
		Weekly	Daily	Control
EastJakarta	(B)*	17.9	15.6	17.3
	(E)*	6.7	7.8	21.3
India Baroda	(B)	53.8	63.5	62.7
	(E)	66.2	44.4	60.1
Delhi	(B)	49.0	47.0	44.6
	(E)	48.2	30.9	57.8
Mumbai	(B)	65.0	61.6	64.8
	(E)	33.9	26.2	58.4
Malawi	(B)	11.1	12.8	NA*
	(E)	12.0	11.9	NA*
Malaysia	(B)	49.8	NA*	0
	(E)	9.0	NA*	10.1
Mali	(B)	29.6	37.1	28.9
	(E)	38.0	30.9	39.0
Peru	(B)	18.4	19.8	15.5
	(E)	17.3	10.9	22.7
Sri Lanka	(B)	25.0	18.5	19.8
	(E)	9.5	8.6	13.4

* (B) refers to baseline and (E) refers to endline

NA – Not available

** Anaemia criteria – Hb < 12 g/L

Evidence on Weekly Iron-Folic Acid Supplementation (WIFS)

A review of impact of weekly iron and folic acid supplementation⁵³ concluded that impact in non-pregnant women of reproductive age was consistent, weekly iron-folic acid supplements taken for at least 12 weeks, with or without deworming, improved iron status as judged by haemoglobin level.

A number of WIFS programmes and trials were launched in the late 1990’s and early 2000 in controlled and programme situations in a number of developing countries of Asia, Africa and South America⁵⁷⁻⁶⁰.

- o In Tanzania, the WIFS programme was implemented unsupervised but with a strong communication component⁶¹. Anaemia in adolescent girls reduced significantly from 49 % to 5 % in one group and from 54%to 23 % in another group with only eight weeks of weekly supplementation. However, in the absence of communication inputs, there was a low compliance of supplement and almost nil impact on anaemia prevalence. The significance of a comprehensive communication input in the WIFS programme is evident from the Tanzania study.
- o Three large-scale WIFS programmes from Vietnam, Cambodia and the Philippines⁶²⁻⁶⁷ for women in the reproductive age group further

support the approach of weekly iron-folic acid supplements (60mg elemental iron and 350 µg folic acid) in unsupervised conditions for reduction of anaemia in women in the reproductive age group, including adolescents.

- In Vietnam the systematic application of social marketing was effective in implementing WIFS in women in the reproductive age group in rural community settings.
- In the Philippines, social marketing and mobilization by the government and private sectors was successful in improving the rate of purchase and consumption of WIFS.
- In Cambodia, social marketing and community mobilization was demonstrated to be effective in implementation of the WIFS approach in both factory settings and in the rural community.

The large scale, Adolescent Anaemia Prevention Program⁶⁸ in Egypt, provides convincing evidence of the benefits of WIFS on both adolescent boys and girls. Under this programme, weekly dosage of iron –folic acid was distributed to both adolescent girls and boys on a fixed day of the week along with intensive nutrition education activities for influencing dietary habits. The consumption of WIFS was monitored and a record was maintained on consumption and compliance. In three months, there was a 13% reduction in anaemia in male adolescents while there was a remarkable 27% decrease in anaemia prevalence in adolescent females.

Evidence on Weekly Iron-Folic Acid Supplementation (WIFS) in SEAR

Similarly, a number of trials on weekly IFA supplements in various countries of SEAR demonstrated that WIFS can be as efficacious as daily supplements with a much lower rate of side effects.

In India, WIFS programme findings in nine states⁵⁹ revealed that with one year's intervention, there was a substantial decrease in anaemia prevalence — the decrease varied from 5% in Jharkhand to 43% in Andhra Pradesh and 50% in Uttar Pradesh. In Uttar Pradesh, adolescent girls were reached in school and out of school setting in an entire district with an intervention package comprising WIFS, six monthly deworming and family life education⁶⁹. WIFS was administered unsupervised to out of school girls while school girls were supervised by teachers on “fixed iron” days, the impact was evaluated in a programme situation. In a period of four years, anaemia prevalence decreased from 73.3% to 25.4% and no significant

difference in impact was observed between girls who were supervised and those who were unsupervised during WIFS intake.⁶⁹ Following this dramatic reduction in anaemia prevalence, the WIFS programme is being up scaled in the entire state as a part of the Adolescent Health Programme. Similar large scale WIFS programme implemented in other states of India, Bihar⁷⁰, Gujarat⁷¹ and Madhya Pradesh⁷², have demonstrated a significant decrease in anaemia prevalence in adolescent school girls and those out of school (Table 4). The programmes had a strong component of education and social mobilization activities and a monitoring system. For improving management and compliance, a “fixed WIFS day” approach was used.

Table 4: Impact of weekly iron folic acid on anaemia prevalence in adolescent school going girls (SGG) and non school going girls (NSGG)^{69,70,71,72} in India.

States	Age (years)	Coverage		Anaemia prevalence (baseline) (%)	% reduction in anaemia prevalence (12 months)	WIFS Compliance (%)
		SGG (Schools)	NSGG (ICDS)			
Bihar*	10-18	79,590	1,91,070	93	8.8	70-72
Gujarat*	12-19	65,000	9,536	74.7	20.5	89-94
Madhya Pradesh (MP)*	10-18	-	25,000	87.8	7.8	> 90
Uttar Pradesh (UP)*	10-19	77,000	73,700	73.3	34.3	86-90

* WIFS, deworming, FLEd except no deworming in Gujarat
 * Fixed day approach used
 * UNICEF supported
 SGG – School Going Girls NSGG – Non – School Going Girls

Cost of WIFS

The weekly iron folic acid supplementation is a low cost intervention – costing less than one third of a dollar per beneficiary per year when administered with helminthes control (Table 5). Without deworming, the cost further goes down to less than one-sixth of a dollar. In all these up-scaled programmes weekly IFA supplements (WIFS) were provided free of charge.

Table 5: Cost of weekly iron and folic acid supplements in selected states of India^{69,70,71,72}

States	Cost* / beneficiary (US\$)/year
Bihar	0.28
Gujarat	0.15*
Madhya Pradesh (MP)	0.33
Uttar Pradesh (UP)	0.36

* No deworming administered

WHO position statement on WIFS for women in the reproductive age group (Excerpts)

In 2009, WHO issued a position statement on WIFS for women in the reproductive age (WRA) group^{73, 74}. The position statement is based on the consensus of a WHO Global Consultation on 'Weekly Iron and Folic Acid Supplementation (WIFS) for Preventing Anaemia in Women of Reproductive Age' held in Manila, in April 2007. The WHO position statement is intended for a wide audience including implementing partners, scientists and governments involved in the design and implementation of public health interventions. Integrated strategies to combat both iron deficiency and anaemia, and to improve iron reserves and folate status of women in the reproductive age are emphasized. The statement highlights the following:

- In populations where the prevalence of anaemia in women in the reproductive age is over 20% (or > 40% in pregnant woman or children under five years) and mass fortification programmes of staple foods with iron and folic acid are unlikely to be implemented within 1-2 years, the WIFS strategy should be considered.
- The recommended composition of WIFS is 60 mg elemental iron and 2800 µg folic acid
- Upon confirmation of pregnancy, WIFS should be replaced by daily supplementation with 60 mg iron and 400 µg folic acid during pregnancy and the first three months postpartum.
- The WIFS programme must be integrated with other efforts to control iron deficiency and anaemia and should be planned as long-term self-sustained interventions that women in the reproductive age will utilize during their child bearing years.
- Successful implementation of WIFS programmes will require motivation and creation of demand by women of reproductive age as the starting point for promoting this new approach, establishing adequate mechanisms to start and sustain programs, including adequate funding, community level support and public-private partnerships, an uninterrupted supply of good quality iron and folic acid supplements, the development and implementation of effective communication strategies, establishment of methods for promoting compliance by women of reproductive age, especially when consumption is not supervised, and integration with effective delivery systems in health, education and the private sector.

Concurrent deworming with WIFS for prevention and management of adolescent anaemia

Several public health programmes have used mass deworming along with IFA administration for prevention and management of IDA in adolescents. The current WHO guidelines for treatment of soil transmitted helminthiasis (STH) are as follows:

Albendazole (400 mg) or Mebendazole (500 mg)	If the prevalence of STH infection in school age children is	
	> 20% and < 50%	Treat x 1 per year
	> 50%	Treat x 2 per year
Exclude pregnant women in 1st trimester		

Source: WHO: Action against Worms, Aug 2007 Issue 9

6. Moving ahead: An effective implementation of WIFS programme for adolescents

- In the South-East Asia Region adolescents constitute about one fifth of the population. Prevalence of iron deficiency anaemia among adolescent boys and girls is very high in countries of the region. Early marriage and early pregnancy is common in some of the countries.
- During pregnancy iron requirements are very high and it is not always possible to absorb an adequate amount of supplementary iron, especially for those women who are iron deficient before pregnancy. Effort to improve iron status and anaemia during pregnancy is therefore rather late and inadequate to meet the high requirements^{60, 75}. In fact, it is noted that longer the pre-pregnancy preventive supplementation, the better its impact on iron nutrition during pregnancy⁶⁴. Pregnancy itself is too short a period for addressing pre-existing anaemia and therefore action for prevention of anaemia must be taken during adolescence itself.
- Where the prevalence of anaemia is above 20% among women in the reproductive age group or more than 40% in pregnant women, weekly iron-folic acid supplementation (WIFS) is recommended as one of the strategies for prevention of anaemia⁵³.
- Weekly administration of IFA has been demonstrated to be effective in several developed and developing countries (including these in the SEA Region) for prevention and management of IDA, among those in the reproductive age group and among

adolescents. Weekly administration of Iron-Folic Acid supplements, accompanied by measures for ensuring adequate focus on information and motivation, has the advantage of not only fewer side effects but of improving compliance and lowering cost^{76,77}.

- With the weekly dose regime of IFA supplements, the requirement for iron tablets is reduced to only 52 tablets per year with an estimated cost of iron tablets being about \$0.12 per girl per year.
- WIFS regime during adolescence is an investment in future for safe pregnancy⁷⁸. Countries in SEAR may consider formulating policy on WIFS intervention and plan for a country-wide large scale implementation of WIFS for adolescents.
- Weekly supplements should contain at least 60mg iron in the form of ferrous sulphate. Building folic acid stores along with iron, prior to pregnancy, has the additional advantage of reducing the risks of neural tube defects (NTD)^{79, 80}. Weekly supplements with only iron (and not folic acid) are recommended for situations where mandatory folic acid fortification has been demonstrated to be effective in reducing neural tube defects.
- Promotion of consumption of WIFS should be combined with the long term sustained efforts to promote dietary diversification and consumption of foods fortified with iron.
- Existing programmes and channels for reaching adolescents must be reviewed and efforts made to build on the available system and structure. It is important that the delivery system is not limited to merely the traditional health system and other options of delivery systems are explored for reaching adolescents such as schools, adolescent groups, adolescent community groups /centers, work places⁸¹, factories, marriage registrar's office etc.
- Adolescent Friendly Health Services (AFHS) centres, wherever established, offer a good opportunity⁸² for reaching adolescents.
- Adolescents who are in school may be easier to reach through the school system while those not in schools could be reached through an adolescent to adolescent approach i.e. a school going adolescent reaches an out-of-school adolescent in the community. This approach is required more for girls, since school drop rates higher among girls in some countries. Additionally, adolescent girls could be encouraged to come together and form a group where nutrition or family life education could be organized routinely.

- The following programme issues need special attention for effective implementation of WIFS programme:
 - Sustained political will
 - Ensuring regular supply of IFA tablets
 - Using a "Fixed Day" approach: A "Fixed weekly IFA day" approach has been demonstrated to be a positive element for effective operationalization of the programme and for increasing compliance.^{62-67, 69-72}
 - Increasing compliance through an effective communication strategy
 - Ensuring community participation
 - Introducing a simple self /group monitoring system
- A comprehensive communication strategy should support the WIFS intervention:
 - It should address the two critical components – creating a demand for iron-folic acid tablets and generating willingness of the participants to ingest them. It has been demonstrated that the distribution of supplements alone, without a communication input, does not guarantee high compliance and consumption⁶¹.
 - It is important that the communication strategy focuses not only on awareness of side effects but also ensures that advantages of WIFS are highlighted^{61, 69}. There is scientific evidence that motivated and well informed adolescents tolerate the negative side effects of iron tablets without reducing compliance⁶¹. In fact, Tanzania⁶¹ study shows that adolescents who were reached through a well planned communication strategy viewed advantages to be more important for continuing WIFS than the side effects.
 - Innovative channels of nutrition education, beyond the school set up in delivering social marketing messages, such as local community promoters and organization of cultural specific events such as pop music, school functions as well as development of comic books, advertising in the mass media, through religious groups for youth, women and men or even through television operas should be explored.
 - Parents must be included as communication channels and act as motivators to bring about and maintain a high compliance rate. Community involvement and engagement is crucial for creating an environment of acceptability of WIFS.
- A social marketing strategy for WIFS has been demonstrated to be successful in situations where adequate supply is ensured and marketing of IFA tablets is encouraged. (Cambodia, Vietnam, the Philippines)⁶²⁻⁶⁷.

- Large-scale, unsupervised trials indicate that counseling of adolescent girls on positive attributes of WIFS is effective in increasing compliance⁶⁹. A study in Tanzania presents scientific evidence that a motivational programme is critical for increasing acceptability and compliance⁶¹ even in the absence of supervision.
- Close monitoring and evaluation of the WIFS programme is very important. Monitoring the distribution and consumption of IFA tablets through a special supplement record register as well as individual monitoring card has proved effective in improving compliance^{61, 69}. In addition, periodic process and impact evaluation should be institutionalized to facilitate programme adjustment and to check whether the desired outcomes are being achieved. In large-scale programmes, external measures need to be introduced for periodic quality checking of IFA tablets supplied or marketed.

References

1. Murray CJL, Salomon JA, Mathers CD, Lopez AD. The global burden of disease. Geneva, World Health Organization, 2002.
2. World Health Organization. The world health report 2002: reducing risks, promoting healthy life. Geneva: WHO, 2002.
3. UNICEF/UNU/WHO/MI. Technical workshop on preventing iron deficiency in women and children – technical consensus on key issues. New York: UNICEF, 1998.
4. Vasanthi G, Fawashe AB, Susie H, Sujatha T, Raman L. Iron and nutritional status of adolescent girls from rural area and urban slum. *Indian Paediatrics*. 1994; 31(2): 127.
5. Agarwal DK, Upadhyay SK, Tripathi AM, Agarwal KN. Nutritional status, physical work capacity and mental work function in school children. Nutrition Foundation of India (NFI). New Delhi. Scientific Report 6. 1987; 30-32: 40-41.
6. Vir S. Adolescent growth in girls – the Indian perspective. *Ind Paed*. 1991; 27(12): 1249.
7. European Communities. Nutrient and energy intakes for the European Community: EG-report. Brussels Luxembourg: Commission of the European Communities, 1993.
8. Beard JL. Iron requirements in adolescent females. *J. Nutr.* 2000; 130(25): 440S.
9. FAO/WHO. Human vitamin and mineral requirements. Report of joint FAO/WHO consultation, Bangkok, Thailand, 2002.
10. Passi S, Vir S. Functional consequences of nutritional anaemia in school age children. In: Nutritional Anaemia. Usha Ramakrishnan. Ed. Florida: CRC Press, 2000.
11. Allen L, Caserlina-Sabel. Prevalence and causes of nutritional anaemia. In: Nutritional Anaemia. Usha Ramakrishnan. Florida: CRC Press, 2000.
12. National Nutrition Monitoring Bureau, Diet and Nutritional Status of Rural Population and Prevalence of Hypertension among adults in Rural Areas. NNMB Technical Report. 2006; No. 24. NNMB, NIN, Hyderabad.
13. National Nutrition Monitoring Bureau, Diet and Nutritional Status of Rural Population. NNMB Technical Report. 2001; No.21. NNMB, NIN, Hyderabad
14. Ahmed F, Zareen M, Khan MR, Banu CP, Haq N, Jackson AA. Dietary pattern, nutrient intake and growth of adolescent school girls in urban Bangladesh. *Public Health Nutr.* 1998; 1(2): 83-92.
15. Guidelines for school health programs to promote lifelong healthy eating. Centre for Disease Control and Prevention. MMWR Recommendation Report. 1996; 45(RR-9): 1-41.
16. International Institute for Population Sciences (IIPS) and ORC Macro. National family health survey (NFHS) III, 2005-06, India. Mumbai: IIPS, 2007.
17. Kotadawala PJ. Gynecological problems in adolescent girls. In: IAP manual in adolescent care. Bhave SY, Nair MKC . Eds. IAP, 2000. Chapt 8. p. 68-85.
18. National Institute of Population Research and Training. Bangladesh demographic and health survey 2007. Dhaka: NIPORT, 2009.
19. National Family Planning Coordinating Board. Indonesia Demographic and Health Survey 2007. Jakarta, 2008.
20. The United Nations Children's Fund. Early marriage, a harmful traditional practice: a statistical exploration. New York: UNICEF, 2005. (http://www.unicef.org/publications/files/Early_Marriage_12.lo.pdf-accessed 6 October 2010).
21. Sri Lanka, Ministry of Finance & Planning, Department of Census & Statistics. Sri Lanka demographic and health survey 2000. Colombo, 2001.
22. Chayovan N. Thailand demographic and health survey 1987. Bangkok: Institute of Population Studies: 1988.
23. Sharma AK, Verma K, Khatri S, Kannan AT. Pregnancy in adolescents: a study of risks and out come in Eastern Nepal. *Ind Paed*. 2001; 38: 1405-9.
24. Sharma V and Sharma A. Health profile of pregnant adolescents among selected tribal population of Rajasthan. *Ind J. Adol Health*. 1992; 13(8): 696-9.
25. Rawat CMS. An epidemiological study of anaemia in adolescent

- girls in the rural areas of Meerut: MD thesis. Meerut: Chaudhary Charan Singh University, 2000.
26. Soemantri AG, Pollitt E, Kim I. Iron deficiency anaemia and educational achievements. *Am J Clin Nutr.* 1985; 42: 1221.
 27. Levin HM. A benefit-cost analysis of nutrition program for anaemia reduction. *Res Observer.* 1986; 1: 219-45.
 28. Webb TE, Oski FA. Behavioural status of young adolescents with iron deficiency anaemia. *J. Spec. Educ.* 1974; 8: 153-6.
 29. Damayanti D, Soekarjo DD, Saskia de Pee, Kusin JA, Martin W, Bloem MW. School-based supplementation: lessons learned in Indonesia. *SCN News.* 2006; 31: 14-18.
 30. Demaeyer EM, Dallman P, Gurney JM, Hallberg L, Sood SK, Srikantia SG. Preventing and controlling iron deficiency anaemia through primary health care: a guide for health administrators and programme managers. Geneva: World Health Organization, 1989.
 31. Scholl TO, Hediger ML, Fischer RL, Shearer JW. Anaemia vs iron deficiency: Increased risk of preterm delivery in a perspective study. *Am J Clin Nutr.* 1992; 55(5): 985-8.
 32. Scholl TO, Hediger ML. Anaemia and iron deficiency anaemia: complications of data on pregnancy outcome. *Am J Clin Nutr.* 1994; 59(2): 492S-500S, discussions 500S-501S.
 33. Brabin L, Brabin BJ. The cost of successful adolescent growth and development in girls in relation to iron and vitamin A status. *Am J Clin Nutr.* 1992; 55: 955.
 34. Vir, S. Control of iron deficiency anaemia – a public health programme priority. Proceedings of XXXVI Nutrition society of India meeting, 26-27th Nov, 1998.
 35. Brabin BJ, Hekimi M, Pelletier D. An analysis of anaemia and pregnancy-related maternal mortality. *J Nutr.* 2001 Feb; 131(2S-2): 604S-614S.
 36. World Health Organization. Iron deficiency anaemia: assessment, prevention and control: a guide for programme managers. Document WHO/NHD/01.3. Geneva: 2001. /publications/enWHO, (http://www.who.int/nutrition/ida_assessment_prevention_control.pdf- 6 October 2010).
 37. World Bank. Public health at a glance - anaemia. 2003. (<http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTHEALTHNUTRITIONANDPOPULATION/EXTPHAAG/0,contentMDK:20588506~menuPK:1314803~pagePK:64229817~piPK:64229743~theSitePK:672263,00.html> – accessed 6 October 2010).

38. UNICEF. State of the world's children. New York: United Nations Press, 2005.
39. Millennium development goals: Bangladesh progress report. Jointly prepared by the Government of Bangladesh and the United Nations Country Teams in Bangladesh. Dhaka: Office of the United Nations Resident Coordinator, 2005. (<http://www.undp.org.bd/mdgs/Bangladesh%20MDGProgress%20Report%202005%20-%20202.pdf> – accessed 6 October 2010).
40. World Health Organization, Regional Office for South-East Asia. Global database, 1997: HFA country reports. In: Nutritional status of adolescent girls and women of reproductive age: report of a regional consultation. New Delhi: WHO-SEARO, 1997.
41. Toteja GS, Padam Singh BS, Dhillon BN, Saxena FU, Ahmed RP, Singh Balendu Prakash K, Vijayraghvan Y, Singh A, Rauf UC Sarma, Sanjay Gandhi, Lalita Behl, Krishna Mukherjee, SS, Swami Viu Meru, Prakash Chandra, Chandrawati, Uday Mohan. Prevalence of anaemia among pregnant women and adolescent girls in 16 districts of India. *Food and Nutrition Bulletin.* 2006; 27(4): 2006.
42. http://www.whobhutan.org/EN/Section4_18.htm
43. Indonesia 2002-2003, young adult reproductive health survey 2002-2003. Jakarta: Central Bureau of Statistics, 2003. Document NFPCB/MOH.
44. WHO MDIS, 2005. http://www.measuredhs.com/pubs/pub_details.cfm?ID=471&srchTp=ctry
45. Myanmar, Ministry of Health. National haemoglobin and nutritional status survey among adolescents. Yangon: National Nutrition Centre, 2002.
46. Binay Kumar Shah, Piyush Gupta. Anaemia in adolescent girls: a preliminary report from semi-urban Nepal. *Indian Paediatrics.* 2002; 39: 1126-1130.
47. Hettiarachchi, Manjula et al, Prevalence and severity of micronutrient deficiency: a cross-sectional study among adolescents in Sri Lanka. *Asia Pacific Journal of Clinical Nutrition,* 2006; 15(1): 56-63.
48. Wibulpolprasert, Suwait. Ed. Thailand health profile 2001-2004. Bangkok: Ministry of Public Health, 2004. (<http://eng.moph.go.th/ContentDetails.php?intContentID=4668&strOrgID=001> – accessed 07 October 2010).
49. Rosanne A, Thurlow Rosanne A, Thurlow Pattanee Winichagoon, Timothy Green, Emorn Wasantwisut, Tippawan Pongcharoen, Karl B Bailey, Rosalind S Gibson. Only a small proportion of anaemia in northeast Thai schoolchildren is associated with iron deficiency. *Am J Clin Nutr.* 2005; 82: 380-387.

50. Behrman JR, Alderman H, Hoddinott J. Hunger and malnutrition. Copenhagen Consensus Challenge Paper, 2004. (http://socialforestrypartners.org/PDF/Hunger_and_Malnutrition.pdf-accessed 07 October 2011).
51. Kanani S, Poojara RH. Supplementation with iron and folic acid enhances growth in adolescent Indian girls. *J. Nutr.*; 2000; 130 (2S): 452S.
52. Mehta MN. Effectiveness of daily and weekly iron and folic acid supplementation in anaemic adolescent girls: final report of research project. Bombay: UNICEF, 1998.
53. Viteri FE. Global consultation on Weekly Iron-Folic Acid Supplementation for preventing Anaemia in women of Reproductive Age Group. Manila, 2007.
54. Wright AJ, Southon S. The effectiveness of various iron supplementation regimens in improving the Fe status of anaemic rats. *Br J Nutr.* 1990; 63: 579-585.
55. Viteri FE. Iron deficiency in children: New possibilities for its control. *Int Child Health.* 1995; 6: 49-61.
56. Beaton GH, McCabe GP. Efficacy of Intermittent iron supplementation in the control of Iron deficiency anaemia in developing countries - an analysis of experience. Ottawa: Micronutrient Initiative, 1999.
57. Berger J, Thanh HTK, Tommaso CS, Suttalak S, Khan NC, Milani S, Hoa PT, Quang ND, Viteri F. Community Mobilization and Social Marketing to Promote Weekly Iron-Folic Acid Supplementation in Women of Reproductive Age in Vietnam: Impact on Anaemia and Iron Status. *Nutrition Reviews.* 2005; 63 (12): S95-S108.
58. Bothwell TH. Iron requirements in pregnancy and strategies to meet them. *Am J Clin Nutr* 2000 72: 257S-264S.
59. Dwivedi A and Schultink W. Reducing anaemia among Indian adolescent girls through once-weekly supplementation with iron and folic acid. *SCN News*, 2006, 31, 19-23.
60. Angeles-Agdeppa I, Schultink W, Sastroamidjojo S, Gross R, and Karyadi D. Weekly micronutrient supplementation to build iron stores in feale Indonesian adolescents. *Am J Clin Nutr* 1997 66: 177-183.
61. Muro G.S et al. Increase in compliance with weekly iron supplementation of adolescent girls by an accompanying communication programme in secondary schools in Dar-es-Salaam, Tanzania. *FNB.* 1999; 20; 435-444.
62. Khan NC, Thanh HT, Berger J, Hoa PT, Quang ND, Smitasiri S,

- Cavalli-Sforza T. Community mobilization and social marketing to promote weekly iron-folic acid supplementation: a new approach toward controlling anaemia among women of reproductive age in Vietnam. *Nutr Rev.* 2005 Dec; 63: S87-94.
63. Berger J, Thanh HT, Cavalli-Sforza T, Smitasiri S, Khan NC, Milani S, Hoa PT, Quang ND, Viteri F. Community mobilization and social marketing to promote weekly iron-folic acid supplementation in women of reproductive age in Vietnam: impact on anaemia and iron status. *Nutr Rev.* 2005 Dec; 63: S95-108.
64. Paulino LS, Angeles-Agdeppa I, Etorma UM, Ramos AC, Cavalli-Sforza T. Weekly iron-folic acid supplementation to improve iron status and prevent pregnancy anaemia in Filipino women of reproductive age: thePhilippine experience through government and private partnership. *Nutr Rev.* 2005 Dec; 63: S109-15.
65. Angeles-Agdeppa I, Paulino LS, Ramos AC, Etorma UM, Cavalli-Sforza T, Milani S. Government-industry partnership in weekly iron-folic acid supplementation for women of reproductive age in the Philippines: impact on iron status. *Nutr Rev.* 2005 Dec; 63: S116-25.
66. Kanal K, Busch-Hallen J, Cavalli-Sforza T, Crape B, Smitasiri S. Weekly iron-folic acid supplements to prevent anaemia among Cambodian women in three settings: process and outcomes of social marketing and community mobilization. *Nutr Rev.* 2005 Dec; 63: S126-33.
67. Crape BL, Kenefick E, Cavalli-Sforza T, Busch-Hallen J, Milani S, Kanal K. Positive impact of a weekly iron-folic acid supplement delivered with social marketing to Cambodian women: compliance, participation, and hemoglobin levels increase with higher socioeconomic status. *Nutr Rev.* 2005 Dec; 63: S134-8.
68. Egypt, Ministry of Health and Population. Egypt's adolescent anaemia prevention program : a report on program development, pilot efforts, and lessons learned. Cairo: Health Insurance Organization, 1999.
69. Vir SC, Singh N, Nigam AK, Jain R. Weekly iron and folic acid supplementation to adolescent girls in school and out of school in a large scale district level programme in the state of Uttar Pradesh, India. *Food and Nutrition Bulletin.* 2008; 29 (3): 186-194.
70. Control of nutritional anaemia in school going adolescent girl: experiences in Bihar. Directorate of ICDS, State Nutrition Cell, Department of Health, Bihar Education Project, State Programme for Elementary education Development, UNICEF.
71. Kotecha PV, Patel RZ, Karkar PD, Nirupam S. Adolescent girls anaemia reduction program-impact evaluation (mid-term) of

- Vadodara district. Vadodara: Government of Gujarat / UNICEF, 2002.
72. Sharma K, Gandhi HA. Study on assessing the impact of adolescent anaemia control project among out of school adolescent girls, a midterm evaluation in Shivpuri district, Madhya Pradesh. Department of Women and Child Development, State Government of Madhya Pradesh, India and UNICEF.
 73. World Health Organization, Regional Office for Western Pacific. Global consultation on weekly iron and folic acid supplementation (WIFS) for preventing anaemia in women of reproductive age, 25-27th April 2007. Manila: WHO-WPRO, 2007.
 74. World Health Organization. Weekly iron and folic acid supplementation (WIFS) in women of reproductive age: its role in promoting optimal maternal and child health. Geneva: WHO, 2009.
 75. De Pee S, Craciano F. Iron Deficiency anaemia in Indonesia: report of the policy workshop. Jakarta: Helen Keller International, 1997.
 76. Schultink W, Iron Supplementation Programme Compliance of target groups and frequency of tablet intake. FNB. 1997; 18: 64-70.
 77. Gross R et al. Daily versus weekly iron supplementation: programmatic and economic implications for Indonesia. FNB. 1997; 18: 64-70.
 78. Schultink W, Gross R. Iron Deficiency Alleviation in Developing countries. Nutr Res Review. 1996,9,281-93
 79. Adank C, Green TJ, Skeaff CM, Briars B. Weekly high dose folic supplementation is effective in lowering serum homocysteine concentration in women. Annals Nutr, Metabol. 2003; 4: 55-59.
 80. Norsworthy B, Skeaff CM, Adankand C, Green TJ. Effects of once a week or daily folic acid supplementation on red blood cell folate concentration in women. Eur J Clin Nutr. 2004; 58, 548-554.
 81. Bhatia S. Social marketing strategies for control of iron deficiency anaemia. Poster presentation at the conference on forging effective strategies to combat iron deficiency. Atlanta: 2001.
 82. World Health Organization. Adolescent pregnancy: issues in adolescent health and development, Geneva: WHO, 2003.

IRON DEFICIENCY ANAEMIA IN ADOLESCENTS

Section II

Country Factsheets

- A Country-wise Update in SEAR

This section presents an overview of the situation analysis in the following South-East Asia Region (SEAR) countries with reference to data on anaemia prevalence, published information on intervention trials of weekly iron and folic acid supplementation, wherever reported, and the status of current country policy regarding anaemia prevention in adolescence girls.

- **Bangladesh**
- **Bhutan**
- **DPR Korea**
- **India**
- **Indonesia**
- **Maldives**
- **Myanmar**
- **Nepal**
- **Sri Lanka**
- **Thailand**
- **Timor-Leste**

**IRON DEFICIENCY ANAEMIA IN ADOLESCENTS
FACTSHEET**

BANGLADESH

BANGLADESH – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile¹

- Population = 150 million
- Adolescent population = 31.2 million (21%)
- Adolescent girls (10-19 years) = 15.3 million (49%)
- Adolescent girls in school (15-19 years) = 3.7 million (24.4%)
- Adolescent girls out of school (15-19 years) = 1.4 million (9.7%)

Anaemia prevalence

- Iron deficiency anaemia (IDA) prevalence reported to vary from 27% - 98%^{2,3}
- On an average 5 million adolescent girls are anaemic

Contributory causes of iron deficiency anaemia

- Over 50% – 60% consume iron less than RDA⁴
- 95% diet from plant sources
- Intestinal helminths prevalent⁵
- Early marriage
 - Median age of marriage = 15.3 years⁶
 - Percent married by 18 years = 78%⁶
 - Median age at first birth = 18.2 years⁶

Weekly Iron and Folic Acid Supplementation (WIFS) Bangladesh Case Study⁷

- Place – Dhaka
- Subjects - 480 post-menarche adolescent (14 – 19 years) girls, working in garment factories
- Prevalence of anaemia – 88%
- Treatment - weekly iron and folic acid supplements (WIFS) with or without addition of vitamin A
- Impact – Hb levels increased from 113 g / L to 122 g / L in 12 weeks
- Conclusion – WIFS is effective, irrespective of vitamin A, in reducing and preventing anaemia in adolescent girls

Moving forward

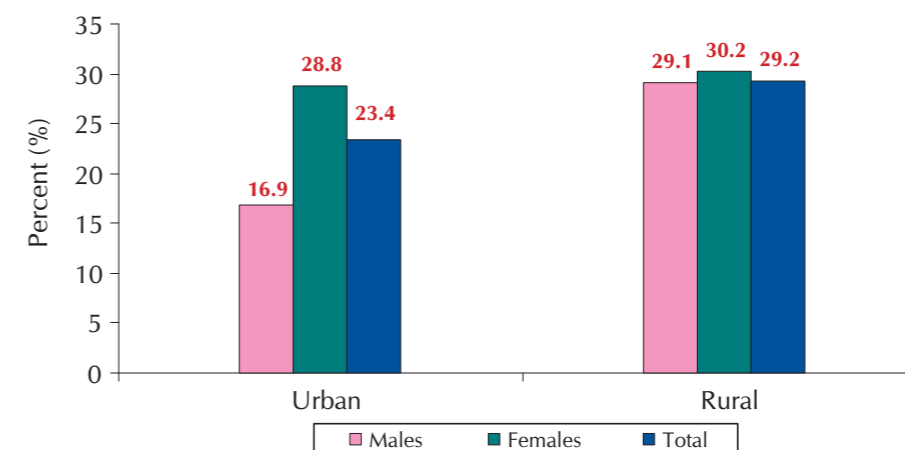
- Formulation of country policy will focus on:
- implementation of WIFS programme for adolescents, in school and out of school,
 - institutionalizing biannual deworming and
 - delaying the age of marriage and first conception.
- Such a package of interventions is critical to prevent anaemia and for achieving the MDG of reducing MMR of 340 in 2008 (World Health Statistics, 2011) to 143 by 2015.

Source: 1, 2, 3, 4, 5, 6, 7

Anaemia – A public health problem during adolescence

Many national nutrition surveys in Bangladesh have shown that anaemia is a serious public health problem across the age groups and geographic groups^{4,8,9}. In 2006, a country wide prevalence survey report^{8,10} revealed that approximately 40% adolescent girls and 31% adolescent boys and 46% of non-pregnant women and 39% of pregnant women are anaemic. The national survey reveals that about one third of adolescent girls in rural and urban areas are anemic (Figure 1). The annual productivity loss due to iron deficiency is US \$ 4.19 or 1.9% of the gross domestic product².

Figure 1: Prevalence of anaemia among adolescents (13-19 years) in Bangladesh^{8,10}



Other studies in Bangladesh have also reported a high prevalence of anaemia. Shahabuddin et al (2000), in a cross sectional survey³ of 10-17 year old unmarried adolescents, reported universal anaemia among 94% boys and 98% girls being anaemic, while clinical signs such as pallor was noted in 38% of adolescents. Ahmed et al (2000)¹¹ reports that anaemia among peri-urban Bangladeshis is a public health problem. Of the 548 adolescent girls (11-16 years) studied, the prevalence of anaemia was 27% while 17% had depleted stores of iron. A study in adolescent female factory workers in Dhaka has shown a high prevalence of anaemia ranging from 44%-49%⁵.

The major contributory factor for anaemia is low dietary intake of iron. Over 50%-60% of adolescents are reported not to meet the recommended dietary allowance (RDA) for Iron⁴. National surveys also indicate that over 95% dietary iron is from plant sources resulting in poor bioavailability of dietary iron. In addition, dietary iron is inadequate to meet the demands of increased iron requirements due to intestinal helminths such as ascaris and hookworm prevalent in Bangladesh in all age groups⁷

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents.

A study on weekly iron folic acid supplementation with or without the addition of vitamin A was undertaken in Bangladesh⁷. A total of 480 post-menarche 14-19 years old adolescent girls, working in garment factories of Dhaka city were studied. These girls with haemoglobin between 80-120 g/L were enrolled in the study. About 88% had haemoglobin less than 120 g/L and were anemic. These adolescent girls were randomly divided in 4 groups and allocated to one of the following supplementation group and received weekly supplementation for a period of 12 weeks.

- 1) Placebo group (a placebo for vitamin A and iron)
- 2) Vitamin A only(2.42 mg retinol)
- 3) Iron and folic acid(120 mg iron as ferrous sulphate, 3.5 mg folic acid)
- 4) Iron and folic acid plus vitamin A (dosage of both iron and vitamin A, as described above in groups 2 and 3)

The intake was supervised and compliance was recorded by the field staff. A substantial reduction in anaemia was noted in girls who consumed weekly supplementation with iron and folic acid with or without the addition of vitamin A (Table 2).

Table 2: Haemoglobin and serum measures of iron status at baseline and after 12 week supplementation period in study participants

Variable	Placebo (n=71)	Vitamin A (n=67)	Iron + folic acid (n=74)	Iron + Folic acid + Vitamin A (n=77)	p ²		
					Within groups over time	Between groups	Time x group interaction
BaselineHb (g/L)	111±9	113±9	113±8	111±10			
Post-supplementation Hb (g/L)	112±10 ^a	116±12 ^b	122±7 ^c	123±9 ^c	0.001	0.001	0.001
Baseline– post supplementation	1.2±7.7 ^a	3.3±7.3 ^a	9.1±7.8 ^b	12.2±10 ^c			

Results of the study confirmed that weekly supplementation programme with iron and folic acid can make a significant difference in the prevention of anaemia in adolescent population.

The study also highlights the need for appropriate and effective intervention in supplementation in all young women before they become pregnant, with adequate attention to the delivery system.

Preventing iron deficiency anaemia among adolescent girls – Moving forward

Recognizing the importance of preventing anaemia, a National Guideline on Prevention and Treatment of anaemia was issued in 2001¹². The recommendations include:

- promoting consumption of weekly iron folic acid tablets (IFA) to adolescent girls and women in the reproductive age group,
- ensuring daily provision of IFA supplementation to pregnant and lactating mothers till 3 months postpartum.
- Implementation of WIFS programme is critical since dietary improvement and availability of fortified food will not take place in the near future.

There is an urgent need to implement weekly IFA supplements for adolescent girls in school and out of school. The IFA distribution programme could be planned to be phased out as soon as the long term and most sustainable measures such as availability of fortified food is in place.

References

1. World Health Organization, Regional Office for South-East Asia. Adolescent health – Bangladesh factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.
2. Ross J and Horton S. Economic consequences of iron deficiency. Ottawa: Micronutrient Initiative, 1998
3. Shahabuddin AK, Talukder K, Talukder MK, Hassan M, Seal A, Rahman Q, Mannan A, Tomkins A and Costello A. Adolescent nutrition in a rural community in Bangladesh. Indian Journal of Paediatrics. 2000 Feb; 67(2): 93-8.
4. Ahmed F. anaemia in Bangladesh: A review of prevalence and etiology. Public Health Nutrition. 2000; 3(4): 385-393.
5. Huq SF. Nutrition profile and prevalence of anaemia in garment workers, MSc thesis. Dhaka: University of Dhaka, 1994.
6. National Institute of Population Research and Training. Bangladesh: demographic and health survey 2004. Dhaka: Mitra and Associates, 2007.
7. Ahmed F, Khan MR and Jackson AA. Concomitant supplemental vitamin A enhances the responses to weekly supplemental iron and folic acid anemic teenagers in urban Bangladesh. American Journal of Clinical Nutrition. 2001; 74(1): 108-115.
8. BBS and UNICEF. Report on anaemia prevalence survey of urban Bangladesh and rural Chittagong Hill Tracts 2003. Dhaka, 2004.

9. HKI and IPHN. anaemia is ac severe public health problem preschool children and pregnant women in Bangladesh. Dhaka, 2002.
10. Hellen Keller International. The burden of anaemia in rural Bangladesh: the need for urgent action. Nutritional Surveillance Project Bulletin No 16, April 2006. Dhaka, 2006.
11. Ahmed F, Khan MR, Islam M, Kabir I, Fuchs GJ. anaemia and iron deficiency among adolescent schoolgirls in peri urban Bangladesh. European Journal of Clinical Nutrition. 2000; 54: 678-683.
12. Institute of Public Health Nutrition. National guidelines prevention and treatment of IDA. Dhaka, 2001.

IRON DEFICIENCY ANAEMIA IN ADOLESCENTS FACTSHEET

BHUTAN

BHUTAN – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile^{1,2,3}

- Population = 0.671 million
- Adolescent population = 0.150 (22.4%)
- Adolescent girls (10-19 years) = 0.075 million (49%)
- Adolescent girls in school (15-19 years) = 0.028 million
- Adolescent girls out of school (15-19 years) = 0.009 million

Anaemia prevalence⁴

- IDA prevalence among non-pregnant women = 54.8%
- IDA prevalence among young mothers aged 6-20 years = 59%
- IDA among children (6-60 months) = 80.6%

Weekly Iron and Folic Acid Supplementation (WIFS) Case Study

None

Moving forward

Reduction of iron deficiency anaemia among adolescent girls through formulation of country policy and programme with the focus on initiating and implementing a WIFS programme for both in-school and out-of-school adolescents, and contribute towards achieving the MDG of reducing MMR of 200 in 2008 (World Health Statistics, 2011) to 140 by 2015.

Sources: 1,2,3,4,

Anaemia – A public health problem during adolescence

Since the 1990s, the government health sector has adopted a policy of universal iron supplements to women during pregnancy and lactation. Despite this, reports of early 2000 reveal that anaemia remains a public health problem with a high prevalence in children, adolescents and women: 59% among young mothers, and 54.8 % among non-pregnant women.

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents

(Note– Efficacy trials not reported from Bhutan)

Preventing iron deficiency anaemia among adolescent girls – Moving forward

Interventions to overcome the public health problem of iron deficiency and iron deficiency anaemia (IDA) require preventive measures to be taken early (10-19 years). According to the 10th Five Year Plan of the Ministry of Health, one of the challenging health objectives of the country is to reduce nutritional anaemia in pregnant women, children under five and adolescent girls⁵.

Improving iron status and prevention of anaemia right from adolescence will positively influence efforts to build pre-pregnancy iron stores. It is evident that waiting till the onset of pregnancy for regular provision and consumption of iron supplements may be too late. Interventions to overcome the public health problem of iron deficiency anaemia require measures to be taken during the age of 10-19 years.

There is therefore an urgent need to strengthen not only the ongoing nation wide programme of universal iron supplements to women during pregnancy and lactation³ but for introducing a new intervention to address anaemia in the adolescent population with weekly iron and folic acid supplements.

Health and Nutrition Profile – MDGs^{6,7,8,9}

Indicator	1990	2000	2005	2009	2015
IMR	90	61	40	52	30
U5MR	123	84	61	79	41
Underweight	38	19	11.1*		19
LBW		13.5	9.3*		
MMR	560	255	NA	200*	140

*2008

References

1. World Health Organization, Regional Office for South-East Asia (SEARO). Adolescent Health – Bhutan Factsheet. Adolescent Health at a Glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.
2. Royal Government of Bhutan. Population and Housing Census of Bhutan 2005. Thimphu, 2005.
3. Royal Government of Bhutan, National Statistical Bureau. National Statistical Year Book of Bhutan 2009. Thimphu, 2009.
4. Royal Government of Bhutan, Ministry of Health. National Anaemia Study 2003: Anaemia among men, women and children in Bhutan, how big is the problem? Thimphu, 2003.
5. Royal Government of Bhutan, Ministry of Health. Nutrition Programme Profile 2008. <http://www.health.gov.bt/doph/ncdd/nutrition.pdf> - accessed July 16, 2011.
6. World Health Organization, Regional Office for South-East Asia (SEARO). 11 questions of 11 SEAR countries. New Delhi: WHO-SEARO, 2007.
7. Royal Government of Bhutan, Ministry of Health. Bhutan National Health System Profile, 2006.
8. *Royal Government of Bhutan, Ministry of Health. National Nutrition, Infant and Young Child Feeding Survey, 2008. Thimphu: 2009.
9. World Health Organization, World Health Statistics, 2011.

IRON DEFICIENCY ANAEMIA IN ADOLESCENTS FACTSHEET

DPR KOREA

DPR KOREA – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile^{1,2}

- Population = 22.7 million
- Adolescent population = 3.8 million (17%)
- Adolescent girls (10-19 years) = 1.8 million (49%)
- Adolescent girls in school (15-19 years) = NA
- Adolescent girls out of school (15-19 years) = 0.7 million (20%)
- Adolescent pregnancy = 1%

Anaemia prevalence

- No data available on prevalence of iron deficiency anaemia in adolescent girls
- Iron deficiency anaemia (IDA) in pregnant women = 23%³

Contributory causes of iron deficiency anaemia

- Data not available

Weekly Iron and Folic Acid Supplementation (WIFS) Case Study

None

Moving Forward

Initiating WIFS programme for in school and out of school adolescents and integrating it in health, education system and country policy, is essential for preventing anaemia, building pre-pregnancy iron stores and for achieving the MDG of reducing MMR of 250 in 2008 (World Health Statistics, 2011).

Source: 1, 2, 3

Anaemia – A public health problem during adolescence

The country has a population of 23.61m with a high maternal mortality ratio (MMR) of 250⁴. Information on anaemia prevalence indicates that over one third of pregnant mothers (34.7%) and children (31.7%) are anemic. Data on prevalence of anaemia in adolescents has not been reported.

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency in adolescents

(Note– Efficacy trials not reported from DPR Korea)

Preventing iron deficiency anaemia among adolescent girls - Moving forward

For reducing prevalence of anaemia during pregnancy, it is critical to address anaemia in girls during the adolescent phase of life. Overcoming iron deficiency and preventing anaemia in girls, through weekly IFA supplementation, will not only build the pre-conception iron reserves for safe motherhood but will also positively influence cognition and physical growth, work output, school concentration as well as reduce morbidity and fatigue.

Additionally, WIFS supplementation would contribute to efforts in reducing the low birth weight incidence of 6.7% and high prevalence of underweight (20.2%) in children below five years.

Introduction of WIFS through the school system or other development programmes is critical for accelerating the achievement of MDG goals on reduction of maternal mortality, child survival and provision of universal elementary education to all children.

References

1. World Health Organization, Regional Office for South-East Asia. Adolescent health – DPR Korea factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.
2. Report on the DPRK Nutrition Assessment 2002, Central Bureau of Statistics, Democratic People's Republic of Korea. (p. 3, 22)
3. World Health Organization, Regional Office for South-East Asia. WHO country cooperation strategy 2009-13, Democratic People's Republic of Korea. New Delhi, 2010.
4. World Health Organization, World Health Statistics, 2011.

**IRON DEFICIENCY ANAEMIA IN ADOLESCENTS
FACTSHEET**

INDIA

INDIA – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile

- Population = 1103 million
- Adolescent population = 226 million (20.5%)¹
- Adolescent girls (10-19 years) = 109.4 million (48.4%)
- Adolescent girls in school (15-19 years) = 16.4 million (15%)
- Adolescent girls out of school (15-19 years) = 38.2 million (35%)

Anaemia prevalence

- Iron deficiency anaemia (IDA) prevalence reported to vary from 56% - 90.1%^{2,3}
- 67.8 – 98.5 million adolescent girls are anaemic

Contributory causes of iron deficiency anaemia

- Traditional cereal based diet – poor bioavailability
- Early marriage²
 - Median age of marriage = 17.7 years
 - Percent married by 18 years = 58%
 - Median age at first birth = 20 years
 - Percentage of adolescents who have begun childbearing = 16

Weekly Iron and Folic Acid Supplementation (WIFS) India Case Study⁴

- Place – Lucknow, Uttar Pradesh
- Subjects – 150, 700 schoolgoing and non-schoolgoing adolescent (10 – 19 years) girls
- Prevalence of anaemia – 92.6% in schoolgoing girls and 73.3% in non-schoolgoing girls
- Treatment - weekly iron and folic acid supplements (100 mg elemental iron and 500µg folic acid) to schoolgoing girls (supervised) and non-schoolgoing girls (non supervised). Deworming tablets (albendazole, 400 mg) at the beginning and after 6 months.
- Impact – Hb levels increased from 105 g / L to 117 g / L in schoolgoing girls and 113 g / L to 120 g / L in non-schoolgoing girls in 6 months. Anaemia prevalence significantly decreased from 92.6% to 58.0% in school going girls and 73.3% to 39% in non school going girls.
- Conclusion – Weekly iron–folic acid supplementation

combined with deworming every 6 months is a feasible and cost effective intervention for the prevention of anaemia in adolescent girls in institutional and community settings.

Moving forward

Integrating the WIFS programme for adolescents, in school and out of school, in the health and education system and country policy for taking it to scale, is essential for preventing anaemia, improving school performance building pre-pregnancy iron stores and for achieving the MDG of reducing MMR of 230 in 2008 to 109 by 2015 (World Health Statistics, 2011).

Source: 1, 2, 3,4

Anaemia – A public health problem during adolescence

Recent reports reveal that anaemia prevalence in adolescent girls is very high—ranging from 50 % to >90%. In 2006, the overall prevalence of anaemia has been reported to be extremely high at 90.1% in adolescent girls 11-18 years old from 16 districts in 4 regions of India³. The study also confirms that 85% of pregnant women are anaemic. The earlier study from western India reports that in the low income group 80-90% had haemoglobin less than 12%⁵. In a study of adolescent girls 10-19 years in urban slums of Southern India Andhra Pradesh, anaemia prevalence is reported to be 67.9% - moderate anaemia 37.05%, mild anaemia 21.42% and 9.4% severe anaemia⁶, while another study from Ranga Reddy district of Andhra Pradesh reports anaemia prevalence in girls 13-15 years to be 83%⁷. Whereas undernutrition is reported (stunting) in one-third of adolescent population⁸, prevalence of anaemia is almost universal.

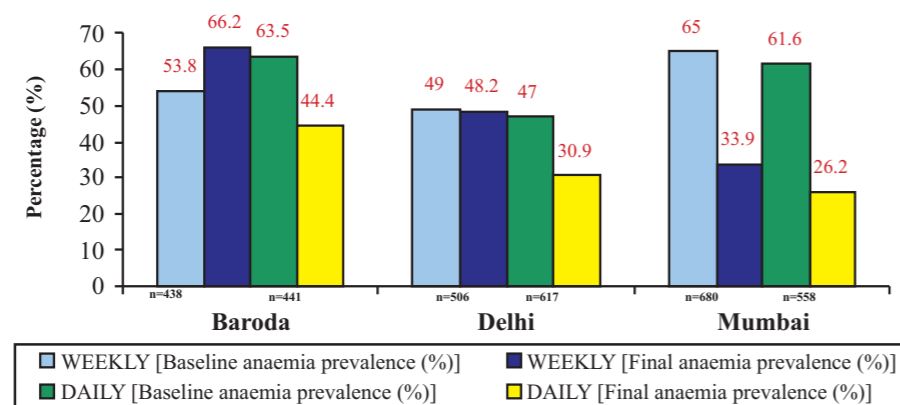
A similar high prevalence of anaemia in rural Rajasthan between 73.3% and 85.4% has been reported^{9, 10}. About 62% of urban adolescent girls from the lower socio economic group are estimated to be anaemic⁸. Anaemia in adolescent girls is now recognized to be a public health problem along with anaemia in other population groups such as young children and pregnant women. The primary cause of iron deficiency and iron deficiency anaemia (IDA) is attributed to lack of bioavailable iron from the traditional cereal-based diets and low consumption of foods rich in heme iron.

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency in adolescents

In India, since the mid 1990s efficacy trials have been undertaken to assess the effectiveness of weekly dose against the daily doses. Three of these studies

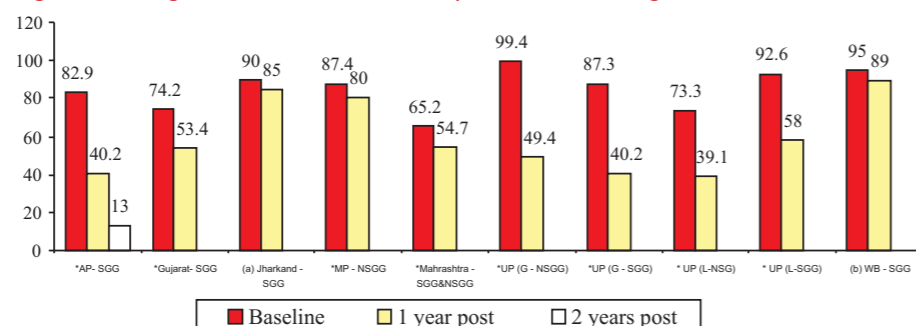
(Figure 1) were included in the global meta - analysis carried out in 1999¹¹. As indicated in Figure 3, daily dose was more effective only in Baroda study while the other two studies indicated that weekly rather than daily consumption of IFA supplement was more cost-effective.

Figure 1: Impact of daily and weekly consumption of IFA tablets (60 mg elemental iron and 500 µg folic acid) on percentage anaemia prevalence¹¹



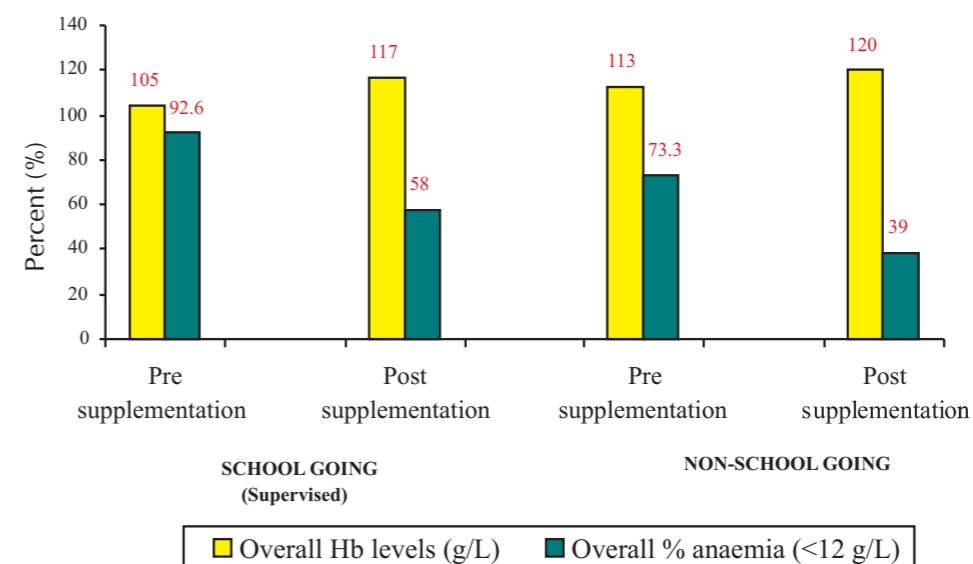
Recent reports of six studies of WIFS in India covering 8.7 million adolescent girls were reviewed¹² and it was demonstrated that WIFS (elemental iron = 60 mg, folic acid = 500 µg) is effective in significantly reducing prevalence of anaemia (Figure 2). It was recommended that a weekly iron folic acid supplement dose be given with effective counseling for reduction of anaemia.

Figure 2: Change in anaemia Prevalence by States (Hb < 120 g/L)



A district case study implemented in the northern state of Uttar Pradesh further supports the need to include WIFS for adolescent girls in the health and nutrition programmes of the country. The project entitled UMANG (Uplifting Marriage Age, Nutrition and Growth) was implemented⁴ in two districts of the state. Six months of implementation in Lucknow district, (irrespective of supervised or non-supervised provision of supplement) resulted in a significant increase in haemoglobin levels and a decrease in the prevalence of anaemia (Figure 3).

Figure 3: Overall haemoglobin levels (g/L) and anaemia prevalence (%) in SG (School Going – supervised) and NSG (Non – School Going – Non supervised) adolescent girls



The effectiveness of weekly iron–folic acid supplementation in reducing anaemia was studied in schoolgirls and non-schoolgirls selected at random in 2003, 2004, and 2006. In 2003, only 73.3% girls were anaemic. After 4 years, the percentage of girls who were anaemic decreased remarkably to 25.4% (Table I).

Table I. anaemia status of combined non-schoolgirls and schoolgirls in 2003, 2004, and 2006⁴

Year	N	Anaemic (haemoglobin < 120 g/L)% of adolescent girls			Non-anaemic (haemoglobin > 120 g/L)	
		Total	Severe (haemoglobin < 70g/L)	Moderate (haemoglobin 70–99g/L)		Mild (haemoglobin 100–119 g/L)
2003	1,173	73.3	0	7.9	65.4	26.7
2004	870	39.0	0	1.1	37.9	61.0
2006	301	25.4	1.6	6.5	17.3	74.6

Cost per beneficiary was calculated and included the cost of IFA supplement, educational materials and activities, training and monitoring. In phase 1 the annual cost was rather high at Rs 119.62 or about US\$3 per beneficiary. It was reduced remarkably to Rs 14.60 (US\$0.36) per beneficiary when the project

implementation moved from the pilot phase in one block in 2001–02 to covering the entire district in 2006. (Table 2).The district level project demonstrated that the WIFS programme built on ongoing programs costs only about a third of a dollar per beneficiary annually. Moreover, the cost is significantly reduced when the implementation is shifted from an experimental project to a programme model and is linked to ongoing health or education programmes.

Table 2: Cost of the intervention

Year	Number of beneficiaries	Yearly per capita cost (Rs)	Yearly per capita cost (US\$)
2003	3,800	119.62	2.96
2004	22,695	58.60	1.45
2006	150,700	14.60	0.36

A major factor responsible for the success of the large project was motivational strategy. Despite weak supervised conditions in non-schoolgirls, timely and repeated counselling with the emphasis on the positive attributes of weekly iron–folic acid supplementation appeared to have contributed to the significant positive outcome.

The present findings confirm that even in a large-scale project with weekly supplementation, appropriate counselling can overcome poor compliance. A focus on the positive attributes of weekly iron–folic acid supplementation appeared to be as effective as supervised intake of the tablets.

Preventing iron deficiency anaemia among adolescent girls - Moving forward

- Recognizing the importance of the adolescent population in achieving overall health and development of the country, a Government of India Consultation meet¹³ in 1998 proposed implementation of demonstration projects at the district level with weekly administration of iron - folic acid supplements. Anaemia during adolescence has been recognized as a problem since 2000 and many states introduced provision of routine iron-folic acid through the Adolescent Girls Scheme (AGS) of the Integrated Child Development Services (ICDS).
- The Government of India in the policy guidelines on anaemia control recognizes the importance of addressing anaemia in adolescent girls. Provision of weekly Iron folic tablets (WIFS), the “big” tablet given to pregnant mothers, is recommended to be made an integral part of anaemia control¹⁴.

- The new Adolescent Girls. Scheme and school system offer opportunities to include WIFS in the package of services for adolescent girls.
- WIFS has been included in the package of interventions for adolescent health in the State Plan of Actions of a number of states under the National Rural Health Mission.
- It is proposed to include WIFS in the revised Adolescent Girls Scheme being finalized by the Ministry of Women and Child Development of the Government of India.

References

1. World Health Organization, Regional Office for South-East Asia. Adolescent health – India factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO/SEARO, 2007.
2. International Institute for Population Sciences (IIPS) and ORC Macro. National family health survey (NFHS) III, 2005-06. Mumbai: IIPS, 2007.
3. Toteja GS, Singh P, Dhillon BS, Saxena BN, Ahmed FU, Singh RP, Prakash B, Vijayraghvan K, Singh Y, Rauf A, Sarma UC, Gandhi Sanjay, Behl Lalita, Mukherjee Krishna, Swami SS, Meru Viu, Chandra Prakash, Chandrawati, and Mohan Uday. Prevalence of anaemia among pregnant women and adolescent girls in 16 districts of India. Food and Nutrition Bulletin. 2006; 27(4): 311-5
4. Vir SC, Singh N, Nigam AK, Jain R. Weekly iron and folic acid supplementation to adolescent girls in school and out of school in a large scale district level programme in the state of Uttar Pradesh, India. Food and Nutrition Bulletin. 2008; 29(3): 186-194.
5. Kanani S, Ghanekar J. anaemia in adolescent girls: a review of research evidence and intervention strategies. New Delhi: Department of Food and Nutrition, MS University of Baroda and UNICEF, 1997.
6. Kokiwar PR, Saiprasad GS. Anaemia among adolescent girls. Indian Journal of Public Health. 2007; 51(4): 252.
7. Shobha S and Sharada D. Efficacy of twice weekly iron supplementation in anaemic adolescent girls. Indian Pediatrics. 2003 Dec; 40(12): 1186-90.
8. National Nutrition Monitoring Bureau (NNMB). Diet and nutritional status of population and prevalence of hypertension among adults in rural areas; National Institute of Nutrition, Hyderabad 2006. Technical Report No. 24.

10. Chaturvedi S, Kapil U, Gnanasekaran N, Sachdev HPS, Pandey RM, Bhanti T. Nutrient intake amongst adolescent girls belonging to poor socioeconomic group of rural area of Rajasthan. *Indian Paediatrics*. 1996; 33(3): 197-201.
11. Sharma Anshu, Prasad Kanti and Visweswara Rao K. Identification of an appropriate strategy to control anaemia in adolescents girls of poor communities. *Indian Paediatrics*. 2000; 37: 261-67.
12. Beaton G, McGabe G. Efficacy of intermittent iron supplementation in the control of iron deficiency anaemia in developing countries. Ottawa: The Micronutrient Initiative, 1999.
13. Dwivedi A and Schultink W. Reducing anaemia among Indian adolescent girls through once-weekly supplementation with iron and folic acid. *SCN News*. 2006; 31: 19-23.
14. Ministry of Health and Family Welfare. National consultation on control of nutrition anaemia in India, 16-17th Oct 1997. New Delhi: Department of Family welfare, Maternal health Division, 1998.

IRON DEFICIENCY ANAEMIA IN ADOLESCENTS FACTSHEET

INDONESIA

INDONESIA – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile¹

- Population = 222 million
- Adolescent population = 41.8 million (18.8%)
- Adolescent girls (10-19 years) = 20.6 million (49.2%)
- Adolescent girls in school (15-19 years) = 13.2 million (52.8%)
- Adolescent girls out of school (15-19 years) = 4.5 million (18.2%)

Anaemia prevalence

- Iron deficiency anaemia (IDA) prevalence reported to be 30%¹
- 7.5 million adolescent girls are anaemic

Contributory causes of iron deficiency anaemia

- Dietary intake of iron less than two thirds of RDA
- Rice based diet – poor bioavailability of iron
- Meal skipping – irregular eating pattern
- Worm infection and poor sanitation
- Early marriage
 - Median age of marriage = 19.8 years²
 - Percent married by 18 years = 33.7%²
 - Median age at first birth = 21.5 years²

Weekly Iron and Folic Acid Supplementation (WIFS) Indonesia Case Study³

- Place – East Jakarta
- Subjects - 360 post-menarche adolescent (14 – 18 years) girls, enrolled in government senior high school
- Prevalence of anaemia – 21.1%
- Treatment – Daily and weekly (low-60 mg and high-120 mg iron content) iron and folic acid supplements with addition of vitamin A (6000 µg) and vitamin C (60 mg). First 8 weeks supervised while 9-12 weeks non supervised. Deworming with single 500 mg dose of mebendazole
- Impact – Weekly supplements with low iron content were most effective - anaemia prevalence decreased from 20%

to 5.7% in 12 weeks. Low iron dosage also resulted in less side effects.

- Conclusion – WIFS is effective in reducing and preventing anaemia in adolescents.

Moving forward

Formulation of country policy with the focus on:

- implementation of the WIFS programme for girls, in school and out of school,
- Institutionalising biannual deworming, and delaying the age of first conception.
- Such a package of interventions is essential to prevent anaemia and for achieving the MDG of reducing MMR of 240 in 2008 to 100 by 2015 (World Health Statistics, 2011).

Source: 1, 2, 3

Anaemia – A public health problem during adolescence

A fourth of the adolescent population is anaemic^{1,4} in Indonesia. Among pre-pubertal boys anaemia prevalence is reported to be higher (24.5%) as compared to pubertal boys (12.1%). On the other hand, risks for girls continue to remain high even after they reach puberty. Prevalence is higher in poorer segments. As per the National Household Health Survey 2001¹, 30% of adolescent girls (10-19 years) were anaemic with Hb levels below 12%. In the 10-14 years group, anaemia prevalence was over 45%. Anaemia prevalence continues to be high during pregnancy—every second pregnant mother (51%) was anaemic and almost every second postpartum mother (45%) and young child (40.5%) was anaemic. The risk of mother dying was 1 in 65 in Indonesia as compared to 1 in 1000 in Thailand. There is inadequate knowledge of the causes and serious implications of iron deficiency and anaemia among young people in the country (Table I).

Low dietary iron intake, often below two thirds of the recommended allowances, is the major cause of anaemia in Indonesia. In the rice based diet of the country, bioavailability of iron is poor. High bioavailability iron rich foods are usually expensive and are seldom consumed. Moreover, during adolescence meal skipping and an irregular eating pattern is common. Worm infection and poor sanitation is also considered important contributory factors to anaemia. As per the Indonesian Demographic Health Survey², 13% of rural and 4% of urban women begin child bearing between 15-19 years of age. The average age of menarche is 11 years⁴. Early conception further contributes to anaemia. The median age at first birth is about 21.5 years and about 19% women⁵ are reported to have their first child before reaching

18 years of age. The risk of maternal mortality can be aggravated by the existence of anaemia and other infectious diseases.

Table 1: Knowledge of causes of anaemia among young people in Indonesia, 2002-2003³

Causes of anaemia	Women (%)		Men (%)	
	15-19	20-24	15-19	20-24
Lack of consumption of meat, fish and liver	23.1	24.4	22.1	23.9
Lack of consumption of vegetables and fruits	28.5	23.5	19.0	23.7
Bleeding	2.9	1.9	1.4	4.0
Menstruation	1.9	3.5	0.7	1.7
Malnutrition	9.9	13.1	10.9	12.6
Infectious diseases	0.4	0.5	0.3	0.4
Other	41.9	49.4	34.5	37.9
Don't know	24.7	15.1	31.6	27.5

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents

A study undertaken in Indonesia highlighted that weekly IFA supplementation rather than daily supplementation is effective. The study by Angeles-Agdeppa et al⁶ in 1997 was carried out in East Jakarta. Subjects were girls aged 14-18 years enrolled in a government senior high school. The prevalence of anaemia; with haemoglobin below 120 g/L was 21.1%. Composition of supplements and frequency of intake is presented below in Table 2.

Table 2: Composition of supplements and frequency of intake

Treatment group	Content of supplements			
	Iron (mg)	Retinol (µg)	Vitamin C (mg)	Folate (mg)
Daily ¹	60	750	60	250
Weekly				
Low iron content ²	60	6000	60	500
High iron content ²	120	6000	60	500
Placebo ³	0	0	0	0

¹Micronutrient supplement administered every school day from Monday to Friday

²Micronutrient supplement administered on Friday, with a placebo from Monday to Thursday

³Placebo administered every school day from Monday to Friday

Impacts of the supplements were investigated in terms of the composition of supplements (60 mg compared with 120 mg iron), the frequency of supplementation (weekly compared with daily) and the duration of supplementation (8 weeks compared with 12 weeks) and the effect of supplementation on iron status six months after the last dose. Side effects were also recorded. The supplements were taken during a break in the teaching schedule and no strict prescription was given regarding ingestion of iron tablet with or without meals or snacks. All subjects were dewormed with a single 500mg dose of mebendazole since infestation with *Trichuris trichiura* was reported in almost one third of the girls investigated. For the first 8 weeks, the ingestion of tablets was supervised while during 9-12 weeks it was not supervised. Blood samples were collected at baseline and after 8 and 12 weeks of supplementation. To determine the longer term effect of supplementation, blood samples were again collected 6 months after the 12 week supplementation period or 9 months after the baseline.

The beneficial effect of supplements on iron and retinol status is shown in Table 3. Weekly supplements with 60 mg iron and 6000µg of retinol was most efficient in improving haemoglobin and retinol status and gave good results in building iron stores when used over a period of 12 weeks. A weekly supplement of 60 mg was considered better since side effects such as nausea and vomiting were noted to increase with 120mg iron weekly supplements. The effect of supplementation remained for a prolonged period of time -daily and weekly supplementation had similar effects on ferritin status even after 6 months.

Table 3: Prevalence of low concentrations of haemoglobin and ferritin at baseline and after 12 weeks of supplementation

Treatment	Proportion having low levels of			
	Haemoglobin < 120 g/L		Ferritin < 15 µg/L	
	0 week	12 week	0 week	12 week
Daily (n=64)	15.6	7.8	21.9	1.6
Weekly				
Low iron content (n=70)*	20.0	5.7	32.9	5.7
High iron content (n=64)**	15.6	7.8	35.9	7.8
Placebo (n=75)	17.3	21.3	30.7	36.0

* 60 mg Fe, 6000 µg retinol, 500 mg folic acid and 60 mg vitamin C

** 120 mg Fe, 6000 µg retinol, 500 mg folic acid and 60 mg vitamin C

The study findings reiterate the findings in different parts of the world that weekly supplementation with 60 mg elemental iron is more beneficial than daily supplementation in preventing iron deficiency and IDA among adolescents.

Preventing iron deficiency anaemia among adolescent girls - Moving forward

- The national guidelines on state policy issued in 1993 adopted a strategy to improve health and nutritional status of the population by improving the quality of health services and promoting a healthy life style with adequate housing and sanitation. Towards improving health and social status of women, an effort was made to increase the median age at marriage and first birth. Efforts to prevent anaemia in adolescent girls should be made an integral part of this policy.
- The current iron-folic supplementation programme for pregnant women should be expanded to non-pregnant women, including adolescent girls.
- Studies on adolescent girls undertaken in the country highlight the effectiveness of WIFS compared with daily supplements in restoring Hb levels. Weekly IFA supplementation or WIFS (each tablet a minimum 60 mg Iron and folic acid 400ug) is recommended.
- Secondary schools offer an opportunity to reach adolescent girls. Today about 60% of girls are enrolled in junior secondary school and therefore the school health programme provides a potential to address anaemia. All secondary schoolgirls should be given weekly Iron and Folic acid (IFA) tablet (Iron 60mg and folic acid 400µg) and a strategy should be developed for reaching girls not in school.
- Additionally, health and nutrition education for adolescent girls as well as boys is critical for influencing dietary practices.
- In regions where there are possibilities of haemoglobinopathies, a screening procedure is suggested before an iron supplementation programme is launched⁷.

References

1. Adolescent health – Indonesia Factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007
2. Statistics Indonesia (Badan Pusat Statistik—BPS) and Macro International. Indonesia demographic and health survey 2007. Calverton, Maryland: BPS and Macro International, 2008.
3. Indonesia Central Bureau of Statistics, MACRO International. Indonesia young adult reproductive health survey: status, policies, programs and issues. Jakarta: BPS, 2003.
4. Ridwan E, Schultink W, Dillon D, Gross R. Effects of weekly iron

supplementation on pregnant Indonesian women are similar to those of daily supplementation. American Journal of Clinical Nutrition. 1996; 63: 884-90.

5. Indonesia, Ministry of Health. Mother and child health handbook. Jakarta, 2002.
6. Angeles-Agdeppa I, Schultink W, Sastroamidjojo S, Gross R, Karyadi D. Weekly micronutrient supplementation to build iron stores in female Indonesian adolescents. American Journal of Clinical Nutrition. 1997; 66: 177-83.
7. Kurniawan YA, Muslimatun S, Achadi EL, Sastroamidjojo S. Anaemia and iron deficiency anaemia among young adolescent girls from peri urban coastal areas of Indonesia. Asia Pacific Journal of Clinical Nutrition. 2006; 15(3): 350-356.

**IRON DEFICIENCY ANAEMIA IN ADOLESCENTS
FACTSHEET**

MALDIVES

MALDIVES – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile¹

- Population = 0.3 million
- Adolescent population = 0.08 million (17%)
- Adolescent girls (10-19 years) = 0.03 million (48%)
- Adolescent girls in school (15-19 years) = 0.01 million (21%)
- Adolescent girls out of school (15-19 years) = 0.007 million (9%)

Anaemia prevalence

- No data available on prevalence of iron deficiency anaemia in adolescent girls
- Iron deficiency anaemia (IDA) in pregnant women = 34.7%²
- Iron deficiency anaemia (IDA) prevalence in children = 31.7%²

Contributory causes of iron deficiency anaemia

- Dietary data not available
- Median age of marriage = 18 years¹

Weekly Iron and Folic Acid Supplementation (WIFS) Maldives Case Study

None

Moving forward

Integrating the WIFS programme for girls, in school and out of school in the health, education system and country policy and delaying age of marriage, is essential for preventing anaemia, building prepregnancy iron stores and for achieving the MDG of reducing MMR of 37 in 2008 to 25 by 2015 (World Health Statistics, 2011).

Source: 1, 2, 3

Anaemia – A public health problem during adolescence

Data on prevalence of anaemia among pregnant women indicates that more than one third of pregnant women are anaemic. However, data on anaemia in adolescent girls has not been reported.

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents

(Note– Efficacy trials not reported from Maldives)

Preventing iron deficiency anaemia among adolescent girls - Moving forward

For reducing prevalence of anaemia during pregnancy, it is critical to address anaemia in girls during the adolescent phase of life. Overcoming iron deficiency and preventing anaemia in girls, through weekly IFA supplementation, will not only build the pre-conception iron reserves for safe motherhood but will also positively influence cognition and physical growth, work output, school concentration as well as reduce morbidity, and fatigue.

Maldives has a population of 329, 000¹. The data of 2005 reveal that the maternal mortality rate is 72. Iron Deficiency anaemia is recognized as a major factor associated with the high MMR with about 57% adolescent girls (15-19 years), 55% pregnant women and 50% non-pregnant women being reported anemic². Universal coverage for all adolescent girls, and in fact all women in the reproductive age, with weekly IFA supplements would be a cost-effective intervention not only to reduce anaemia but in positively influencing in the achievement of MDGs (see Table 1).

Table 1 :Health and Nutrition Profile – MDGs^{3,4,5}

Indicator	1990	2000	2005	2009	2015
IMR	32	21	12	11	11
U5MR	48	30	16	13	16
Underweight	46-52	30	27		23
LBW			9*		
MMR	500	78	72	37*	25

*2008

References

1. World Health Organization, Regional Office of South-East Asia. Adolescent health – Maldives factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.
2. Maldives, Ministry of Health. Multiple indicator cluster survey 2001. Male, 201.
3. World Health Organization, Regional Office for South-East Asia. 11 health questions about the 11 SEAR countries. New Delhi: WHO-SEARO, 2007.
4. Maldives, Ministry of Health. Maldives health statistics report 2006. Male, 2006.
5. World Health Organization, World Health Statistics, 2011

IRON DEFICIENCY ANAEMIA IN ADOLESCENTS FACTSHEET

MYANMAR

MYANMAR – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile¹

- Population = 50.5 million
- Adolescent population = 10.4 million (20.7%)
- Adolescent girls (10-19 years) = 5.1 million (49.5%)
- Adolescent girls in school (15-19 years) = NA
- Adolescent girls out of school (15-19 years) = 2.7 million (54%)

Anaemia prevalence

- Iron deficiency anaemia (IDA) prevalence reported in 45.2%² women

Contributory causes of iron deficiency anaemia

- Diet data not available
- Worm infestation
- Early marriage
 - Mean age at first marriage = 26.1 years³
 - Percent married by 18 years = 11%³
 - Median age at first birth = 22 years³
 - Adolescent pregnancy is not common
 - 1.9% start childbearing at age 15, 8.2% before the age 18³

Weekly Iron and Folic Acid Supplementation (WIFS) Myanmar Case Study

None

Moving forward

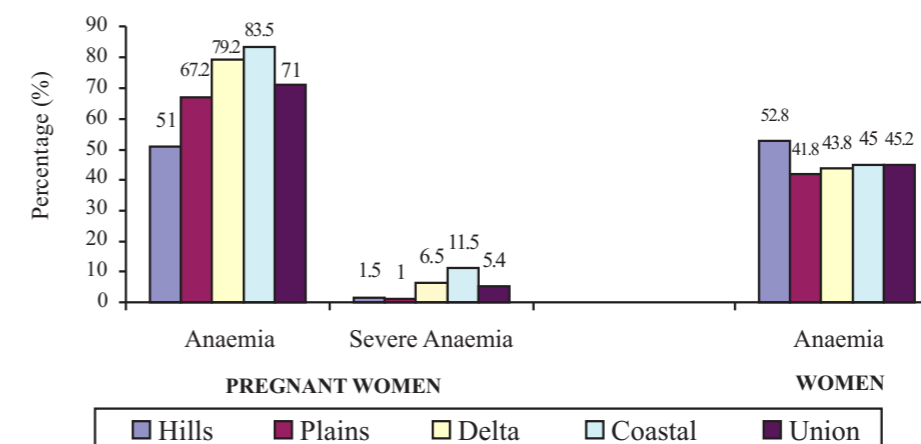
Integrating the WIFS programme for girls, in school and out of school in the health, education system and country policy for health and care of youth, institutionalising biannual deworming and delaying the age of first conception, is essential to prevent anaemia and for achieving the MDG of reducing MMR of 240 in 2008 to 63 by 2015 (World Health Statistics, 2011).

Source: 1, 2, 3

Anaemia – A public health problem during adolescence

Anaemia prevalence is reported to be high among women and children. Studies conducted between 1978-80 indicated that prevalence of anaemia among women was 58-80%⁴. The National Nutrition Survey, 2002 showed that 26% of 10-18 year old adolescents were suffering from some form of anaemia⁵. Micronutrient Survey 2003² indicated that the prevalence of anaemia among pregnant mothers remained high though a regional variation was observed. (Figure 1). The Micronutrient Survey 2005 indicated prevalence of anaemia at 45.2% in women and was found to be associated with iron deficiency and worm infestations. The prevalence was significantly higher in the Hills than in other regions.

Figure 1: Prevalence of anaemia in women²



Dietary data on iron intake is not reported. However, the diet being traditionally rice based, bioavailability of iron is poor. This could be one of the causes for high prevalence of iron deficiency anaemia.

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents

(Note– Efficacy trials not reported from Myanmar)

Preventing iron deficiency anaemia among adolescent girls - Moving forward

- The reproductive Health Project accords high priority to adolescent health.
- The New Health Care Project for Adolescent Youth is being implemented as a WHO funded programme under the National Health Plan 2001-2006⁶.
- The School and Youth Health Project, in collaboration with WHO has recently initiated a process to develop an adolescent health strategic plan 2005-2009. This is a part of actions to accelerate efforts “to lift health, fitness and education standards” of the entire nation and for achieving the MDG goals. Taking into consideration the critical role played by deficiency of iron in influencing MMR, LBW, IMR and under five mortality, it is desirable that the weekly iron supplementation programme for adolescence girls (in school and out of school) is integrated in the health and education systems of the country and integrated into the policy for health and care of youth. In fact, building iron stores during adolescence itself will be beneficial since it has been observed that in spite of decades of intervention with iron-folic acid supplements during pregnancy, a significant reduction in anaemia prevalence has not been achieved. Programme interventions must start prior to pregnancy and efforts should be made to introduce and implement weekly iron-folic acid supplementation from adolescence itself.
- The weekly iron-folic acid supplementation programme could be phased out when dietary interventions, including food fortification, is in place.

Health and Nutrition Profile – MDGs^{7*, 8,10}

Indicator	1990	2000	2005	2009	2015
IMR	98	55	50	54	28
U5MR	130	78	67	71	39
Underweight	39	35	32		19
LBW		31.8			
MMR	232	255	380	240*	63

*2008

References

1. World Health Organization, Regional Office of South-East Asia. Adolescent health – Myanmar factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.
2. Union of Myanmar, Ministry of Education. EFA Mid Decade Assessment Report, August 2007, Yangon (p. 6)
3. Adolescent health – Myanmar factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007
4. DeMaeyer E, Adiels-Tegman M. The prevalence of anaemia in the world. World Health Statistics Quarterly. 1985; 38: 302-16.
5. National Nutrition Centre. National haemoglobin and nutritional status survey among adolescents. Yangon, 2002.
6. Union of Myanmar, Ministry of Education. EFA Mid Decade Assessment Report, August 2007, Yangon (p. 5)
7. Union of Myanmar, Millennium Development goals report 2006. (p.8)
8. Population Reference Bureau. The world's youth 2006 data sheet. Washington DC, 2006.
9. World Health Organization, Regional Office for South-East Asia. 11 health questions about the 11 SEAR countries. New Delhi: WHO-SEARO, 2007.
10. World Health Organization, World Health Statistics, 2011.

**IRON DEFICIENCY ANAEMIA IN ADOLESCENTS
FACTSHEET**

NEPAL

NEPAL – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile¹

- Population = 27 million
- Adolescent population = 6.3 million (23.3%)
- Adolescent girls (10-19 years) = 2.6 million (42.5%)
- Adolescent girls in school (15-19 years) = NA
- Adolescent girls out of school (15-19 years) = 1.2 million (48%)

Anaemia prevalence

- Iron deficiency anaemia (IDA) prevalence reported to vary between 33% - 68.8%^{2,3}
- 0.8 – 1.7 million adolescent girls are anaemic

Contributory causes of iron deficiency anaemia

- Dietary intake of iron inadequate in 71% women
- Irregular eating pattern and high consumption of potato and snacks, poor food diversification⁴
- Parasitic infection
- Early marriage
 - Median age of marriage = 16.8 years⁵
 - Percent married by 18 years = 63.2%⁵
 - 40% married adolescents begun childbearing by age 19⁵
 - Median age at first birth = 19.9 years⁵
 - 21% adolescent girls (15-19 years) are mothers / pregnant⁵

Weekly Iron and Folic Acid Supplementation (WIFS) Nepal- Case Study²

- Place – Dharan Municipality of Nepal
- Subjects – 225 girls from middle socio economic groups between ages 11-18 years
- Prevalence of anaemia – 68.1% - 70.1%
- Treatment – daily (supervised) and weekly (supervised) iron and folic acid (Ferrous sulphate 350 mg and folic acid 1.5 mg) supplements (WIFS) for 14 weeks
- Impact – Anaemia (haematocrit < 36) prevalence decreased from 68.6% to 20% in daily group, 70.1% to 13.4% in weekly group and 68.1% to 65.3% in control group in 14 weeks
- Conclusion – Supervised WIFS (low cost and high compliance) is more effective than supervised daily IFA administration in reducing and preventing anaemia in adolescent girls.

Source: 1, 2, 3

Moving forward

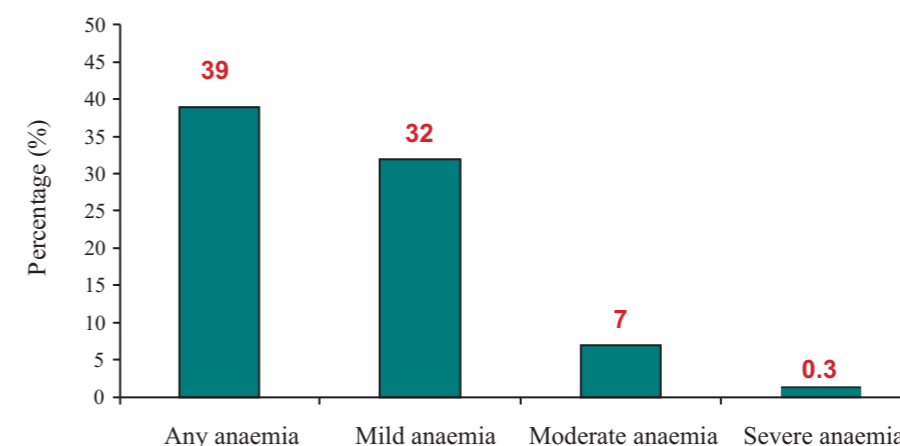
Formulation of country policy with focus on:

- implementation of WIFS programme for girls, in school and out of school,
 - institutionalizing biannual deworming, and
 - delaying the age of first conception.
- Such a package of interventions is critical to prevent anaemia and for achieving the MDG of reducing MMR of 380 in 2008 to 134 by 2015 (World Health Statistics, 2011).

Anaemia – A public health problem during adolescence

Iron deficiency anaemia is the most common nutritional problem in Nepal affecting approximately 39% women in the age group 15-19 years⁵.

Figure 1: Prevalence of anaemia in women aged 15-19 years⁵



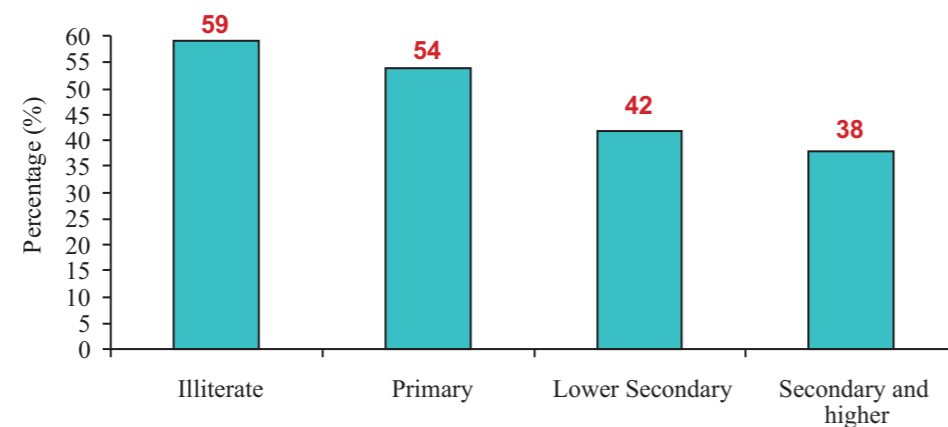
According to the 1998 Nepal Micronutrient Status Survey (NMSS)³, 72% of women under the age of 20 years were anemic. In a study conducted by the Ministry of Health in the Central Development Region of Nepal⁴, prevalence of anaemia among adolescent girls was as high as 46%.

A distinct variation in prevalence of anaemia, according to ecological zone, has been reported. The highest level of anaemia is reported by NMSS in the Terai region followed by the Mountainous regions³. Kathmandu was reported to have the highest prevalence of anaemia (54%) followed by Lalitpur (50%) and Bhaktapur (33%). Moreover, in Nepal a high prevalence of anaemia has been reported among special ethnic groups such as Lama, Tamang and Sherpa⁶.

The results of NMSS also reveal a relationship of prevalence of anaemia with the level of education — the prevalence of anaemia is lower among girls with higher education (figure 2). Early marriage is the key factor contributing to very poor enrolment of adolescent girls in school. Early marriage and early conception is linked to low maternal weight, height, body mass index with adverse effect on maternal mortality and higher chances of low birth weight.

Similarly girls who are from the wealthy class have lower prevalence of anaemia whereas no significant difference is observable among the girls from the middle and lower economic status. Similarly, a study conducted among school girls aged 14-17 years in Kathmandu valley confirmed that anaemia was a severe nutritional problem in adolescent girls even in urban areas where 64% of the girls are reported to be anaemic⁷. In a study undertaken by Shah and Gupta (2002)² in the semi-urban setting in adolescent girls aged 11-18 years, the overall prevalence of anaemia was found to be 68.8%, with hematocrit level less than 36, as per the WHO cut off. Mostly anaemia is ignored since a majority of these girls do not realize that they are anaemic⁷.

Figure 2: Prevalence of anaemia by education among adolescent girls aged 14-19 years in the Central Development Region³



The most common cause of anaemia in Nepal is considered to be inadequate intake of iron from food followed by parasitic infection since data reveals that only 34% of women aged 15-19 consumed iron rich food⁵. Anaemia prevalence in the urban area has also been associated with a poor pattern of food consumption and a long-term exposure of under-nutrition⁴.

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents

A study was conducted on a group of girls from grades 8-12 in the Dharan municipality². Girls from middle socio-economic groups between ages 11-18 years (N = 225) were divided in three groups—one group received Iron-folic acid (Ferrous Sulphate 350 mg and Folic acid 1.5mg) daily while the other group received the dosage weekly for a period of 14 weeks. The third group did not receive any drug. The weekly group consumed iron-folic acid tablets, under supervised conditions, on a fixed day of the week. For the daily group, parents were handed over a week's supply with instructions to give a daily dose.

As shown in Table 2, the prevalence of anaemia (defined as hematocrit less than 36%) declined significantly (p < .001) from 68.6% to 20% in the group receiving daily supplement while in the weekly supplementation group, anaemia decreased from 70.1% to 13.4%. The prevalence of anaemia in the non-supplemented group changed little—from 68.1% to 65.3%. The study proved that supervised weekly iron supplementation is as effective daily administration in a supervised situation. In the daily supplementation group, the drop out rate was almost double compared to weekly dose since the compliance was poor.

Table 2 --Impact of haematinic therapy on prevention of anaemia²

	Group A daily supplementation (n=70)*	Group B weekly supplementation (n=67)	Group C control (n=72)
Pre - supplementation			
No. (%) Anaemic	48 (68.6)	47 (70.1)	49 (68.1)
Mean Haematocrit ± SD#	32.9 ± 3.5	33.2 ± 3.6	34.2 ± 2.9
Post - supplementation			
No. (%) Anaemic	14 (20)	9 (13.4)	47 (65.3)
Mean Haematocrit ± SD#	41.0 ± 5.6	40.4 ± 4.9	34.1 ± 3.3

* Ferrous sulphate = 350 mg and Folic acid = 1.5 mg

Prevalence of anaemia defined as haematocrit < 36%

The study confirms that weekly supervised iron-folic acid administration is an effective alternative to daily administration. Moreover, the study

demonstrates that provision of weekly supplement to adolescent girls through school based programme lowers the prevalence of anaemia in areas with high prevalence of iron deficiency and iron deficiency anaemia. Provision of weekly instead of daily dosage is not only effective but also would reduce cost and improve compliance. Prevention of anaemia should also include de-worming since data of Shah and Baig (2001)⁸ indicate that among pregnant women at antenatal clinic at Dhankuta district, 58.9% women were anaemic and 46.5% had helminthic infestation. A study undertaken by Curatale et al⁹ showed a significant relationship of anaemia with helminthic infestation in school children. Administration of de-worming therefore is crucial in anaemia prevention programmes for adolescent girls.

Preventing iron deficiency anaemia among adolescent girls - Moving forward

- The antenatal iron supplementation programme was introduced in Nepal over two decades. However, coverage and compliance was reported to be poor. With the “Intensified Antenatal Iron supplementation Programme (IAISP)”, the coverage of IFA supplementation in pregnant women increased to 68% in 2002-2003. Efforts for reducing anaemia during pregnancy would be much more effective if iron reserves are built prior to pregnancy.
- The National Adolescent Health and Development Strategy (NAHDS) 2000 aims to improve access to and coverage of the overall programme with quality assurance for adolescents—who make up more than one fifth of the population . The package of services include information, education and counseling on human sexuality towards developing responsible sexual behaviour and responsible parenthood.
- Nutrition education as well as weekly provision of iron supplements to girls in school as well as those out of school should be considered to be made a part of the NAHDS.
- Additionally, promoting fortification of flour with nutrients should be encouraged since a pilot project is already being implemented In Nepal to experiment with a technology for small scale fortification of flour with iron, vitamin A and folic acid.

References

1. World Health Organization, Regional Office of South-East Asia. Adolescent health – Nepal factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.

2. Shah BK, Gupta P. Weekly versus daily iron and folic acid supplementation in adolescent Nepalese girls. Archives of Pediatrics& Adolescent Medicine. 2002; 156: 131-135.
3. Nepal, Ministry of Health, Child Health Division, HMG/N. Nepal micronutrient status survey. Kathmandu, 1998.
4. Rikimaru T, Joshi N, Pandey S. Prevalence of anaemia and its relevant factors among community adolescents in the Central Development Region of Nepal. Kathmandu: Child Health Division, Ministry of Health/World Health Organisation/Japan International Cooperation Agency, 2004.
5. Nepal, Ministry of health and population. Nepal demographic and health survey 2006. Kathmandu, 2007.
6. Bondevik GT, Ulstein M, Lie RT, Rana G, Kvale G.. The prevalence of anaemia in pregnant Nepali women—a study in Kathmandu. Acta Obstetrica et Gynecologica Scandinavica. 2000; 79(5): 341-349.
7. Rikimaru T, Joshi N, Pandey S. Prevalence of anaemia and its relevant factors among high school girls of Kathmandu valley-Nepal. Kathmandu: Child Health Division, Ministry of Health/World Health Organization/Japan International Cooperation Agency, 2003.
8. Shah BK, Baig LA. Association of anaemia with parasitic infection in pregnant women: results from a hospital based study done in Eastern Nepal. Journal of Ayub Medical College, Abbottabad. 2005 Jan-Mar; 17(1): 5-9
9. Curtale F, Tilden R, Muhilal, Vaidya Y, Pokhrel RP, Guerra R. Intestinal helminthes and risk of anaemia among Nepalese Children. Panminerva Medicine. 1993; 35(3): 159-66.

**IRON DEFICIENCY ANAEMIA IN ADOLESCENTS
FACTSHEET**

SRI LANKA

SRI LANKA – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile¹

- Population = 19.2 million
- Adolescent population = 3.5 million (18.3%)
- Adolescent girls (10-19 years) = 1.7 million (49.4%)
- Adolescent girls in school (15-19 years) = 1.5 million (89%)

Anaemia prevalence

- Iron deficiency anaemia (IDA) prevalence reported to vary between 11.1% - > 50%^{2,3}
- 0.1 – 0.8 million adolescent girls are anaemic

Weekly Iron and Folic Acid Supplementation (WIFS) Sri Lanka Case Studies^{4,5}

Case study 1⁴

- Place – 5 districts (Vavuniya, Monaragala, Rathnapura, Hambantota, Ampara)
- Subjects – 1200 children of grade 7 and 10 (120 children / grade / district (6 schools))
- Prevalence of anaemia – 12% - 22.7%
- Treatment – Vitamin A mega dose and mebendazole on first day followed by weekly iron and folic acid supplements (WIFS) containing 200mg ferrous sulphate (60 mg elemental iron), 250 µg folic acid and 100 mg vitamin C for 6 months under supervision of teachers
- Impact – Anaemia prevalence decreased in two districts in 6 months (Vavuniya – 49.8% coverage, 22.7% to 12.7%, Monaragala – 38.8% coverage, 17.2% to 13.2%). In other 3 districts coverage was poor (16.4% - 25.9%) due to irregular supply of supplements
- Conclusion – Despite low coverage (38% - 50%), WIFS is effective in reducing and preventing anaemia in adolescent girls in 6 months

Case study 2⁵

- Place – Colombo district
- Subjects – 659 adolescent school girls (10 – 17 years)
- Prevalence of anaemia – 21%

Source: 1, 2, 3, 4, 5,

- Treatment – A double blind trial – following deworming, IFA dosage given for 8 weeks under supervision - daily (5 days) and weekly (1 day, 4 days placebo) iron and folic acid (60 mg iron, 250 µg folic acid and 100 mg vitamin C) supplements
- Impact – Anaemia prevalence decreased in 8 weeks from 25% to 9.5% in weekly group, 18.5% to 8.6% in daily group and 19.8% to 13.4% in placebo. Side effects experienced by 0.01% only.
- Conclusion – WIFS is effective (simple to administer, cost effective, greater compliance and fewer side effects) in reducing and preventing anaemia in adolescent girls

Moving forward

- Introduction of WIFS and biannual deworming through the school system is recommended for prevention of anaemia.
- Such a package of intervention is critical to build prepregnancy iron stores and for further reducing MMR of 39 in 2008 to the MDG of 36 by 2015 (World Health Statistics, 2011).

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents

A study of adolescents aged 11-19 years indicated that the prevalence of anaemia in the adolescent population is 31.65% in boys and 40% in girls⁶. The prevalence of anaemia in the adolescent age group is very similar to the 36% reported in pregnant women⁷. However in a nationally conducted cross sectional study² conducted in 6264 school adolescents aged 10-15 years, the overall percentage prevalence of anaemia was only 11.1%. The highest prevalence (37%) was noted among 14 year old girls. The low prevalence may be due to early stages of iron deficiency and absence of overt anaemia as reported in an earlier study of 14 – 18 years old⁸.

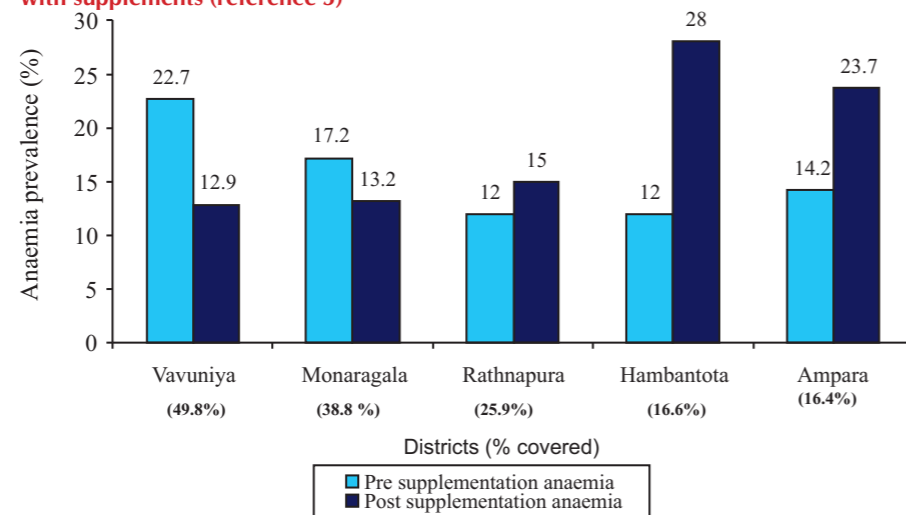
A recent cross sectional anaemia prevalence study³ in adolescent girls aged 12-16 years in Galle district reported that in adolescent girls, haemoglobin concentrations ranged from 113.8 and 114.6 g/L and the prevalence of anaemia continued to be over 50% with the increase in age. However, in case of male adolescents, anaemia prevalence was reported to decrease with increase in age - from 71.4% to 44.1%.

Two studies on WIFS trials are reported. Both studies were conducted in school situations.

Study 1: Jayatissa and Rajaratne⁴ studied the impact of iron supplementation among adolescents for a planned period of 6 months. The study was undertaken in 5 of the 25 districts. Teachers were trained to carry out the programme. All children of grade 7 - 10 were given weekly supplements on a fixed day. On the first day, vitamin A mega dose and mebendazole were given. The weekly supplement contained 200mg Ferrous Sulphate (60 mg elemental iron), 250 µg folic acid and 100 mg vitamin C. Despite supervision by teachers, the coverage with supplements was over 30 % in only two of the 5 districts while in the remaining two districts it was poorer. The reasons for poor coverage was irregular supply of supplements, school holidays etc.

About a third of the total children were assessed for haemoglobin. In districts where the supplement coverage was over 38%, there was a remarkable reduction in prevalence of anaemia — district Vavuniya (from 22.7% to 12.9%) and district Monaragala districts.(from 17.2% to 13.2%). In the remaining 3 districts, with poor coverage of children with supplements, no decrease in anaemia prevalence was observed (Figure 1). The study proved that despite a low coverage of about 38% - 50%, weekly dose was effective in reducing anaemia and it was recommended that weekly iron supplementation programme, with the involvement of health and education sectors should be implemented for at least a period of 6 months for adolescents in 7-10th grade.

Figure 1: Comparisons of anaemia prevalence in districts - % of children covered with supplements (reference 5)



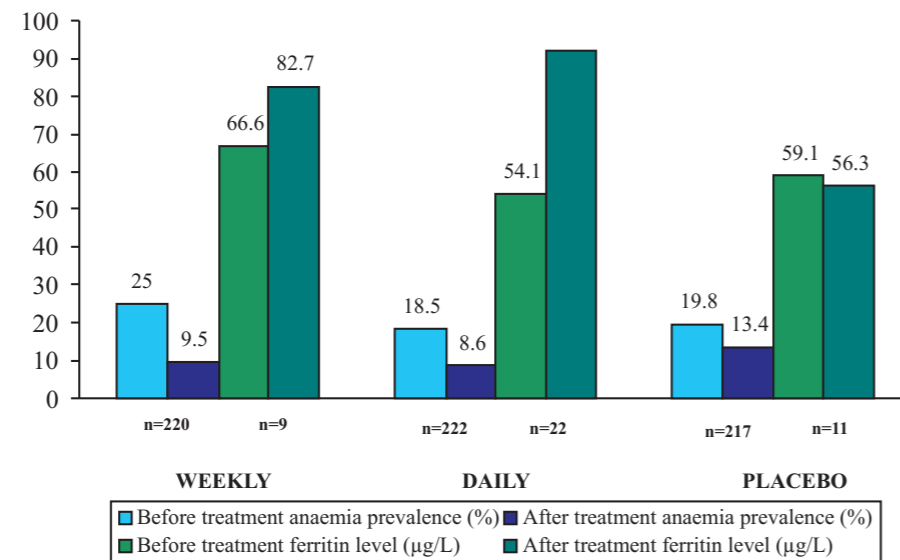
Study 2: In another efficacy study in Sri Lanka⁵, impact of daily and weekly supplementation of iron-folic acid on 659 adolescent school girls (10-17 years), enrolled from classes 6 - 10 in 9 schools in the district in Colombo, were studied. These girls were divided in three groups and were studied in an 8 week double blind trial. All the groups received supplements or a placebo replacement for supplement for 5 days a week i.e. one group received 60mg iron, 250 µg folic acid and 100mg vitamin C daily from Monday to Friday. The second group received the same supplement weekly on a fixed day (Mondays) and for the remaining 4 days received a placebo. The third group was given only a placebo from Monday to Friday. The teachers administered the tablets at the time of marking attendance registers at around 9 am. All the participants were de-wormed at the beginning of the study.

The dropout rate was 4.5%; reasons for dropping out were side effects in 52%, left school 32%, at doctor's advice to take some other treatment (16%). A total of 659 girls completed the study. The number of girls in each of the three groups i.e. weekly, daily and placebo groups were almost the same - 220 (33%), 222 (34%) and 217 (33%) respectively. The side effects were reported by a total of 16 girls in the study, 11 in daily supplement groups and 5 in weekly group which included sleepiness, abdominal pain, constipation, rash and nausea.

The girls were classified anemic according to the age-specific cut offs for initial haemoglobin values (for over 12 years and under 12 years of age, 12 and 11.5 g/dl respectively). Daily and weekly supplementation had greater effect on haemoglobin levels than placebo. The overall prevalence of anaemia was 21.1%. The prevalence of anaemia was reduced from 25% to 9.5% by weekly supplementation and from 18.5% to 8.6% by daily supplementation and in the placebo group from 19.8% to 13.4% (Figure 2). The rise in haemoglobin in the placebo group could be attributed to deworming.

About 8%-9% girls remained anaemic despite daily or weekly doses. More prolonged treatment or addressing deficiency of other nutrients could possibly facilitate in reducing anaemia prevalence. The impact of daily or weekly dose on haemoglobin levels was not significantly different. However, daily administration of iron produced a greater increase in serum ferritin levels than the weekly dosage while there was no change in ferritin levels for the placebo group. The unit cost of weekly supplement was only US \$ 0.05.

Figure 2: Prevalence of anaemia and serum ferritin level (in a sub sample) before and after 8 weeks of treatment



The study demonstrated that weekly supplementation is simple and economically advantageous to improve Hb status of adolescent girls. Moreover, consumption of weekly supplements generates fewer side effects resulting in increased compliance. The compliance of weekly dose of IFA would be further enhanced if the supplements are administered through school systems.

The results of this study support introduction of a policy of administering weekly doses of iron for prevention of anaemia in adolescents. The study recommends introduction of a system of fixed day weekly iron supplementation programme in secondary schools of Sri Lanka for controlling anaemia among adolescents on a long term basis.

Preventing iron deficiency anaemia among adolescent girls - Moving forward

Since 1990, the government has demonstrated commitment to strengthen maternal and child health services. With over 35% adolescent girls anaemic, it is critical to prevent anaemia in the prepregnancy stage. Over 65% of adolescent girls could be reached through the school system using a fixed day approach. A strategy needs to be formulated to reach out of school girls.

References

1. World Health Organization, Regional Office of South-East Asia. Adolescent health – Sri Lanka factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.
2. Jayatissa R and Ranbanda RM: Challenging nutritional problems among school going adolescents in Sri Lanka; 10-15 years of age, Colombo: Medical Research Institute, (p. 2). (personal communication).
3. Hettiarachchi M, Liyanage C, Wickremasinghe R, Hilmers DC, Abrahams SA. Prevalence and severity of micronutrient deficiency: a cross sectional study among adolescents in Sri Lanka. Asia Pacific Journal of Clinical Nutrition. 2006; 15 (1): 56-63.
4. Jayatissa R and Rajaratne N. Iron supplementation for school children of Grade 7 and 10 in Sri Lanka: Department of Nutrition, Medical Research Institute Ministry of Health, Nutrition & Welfare Sri Lanka In collaboration with Family Health Bureau and UNICEF July, 2003 (personal communication).
5. Jayatissa R, Piyaasena C. Adolescent schoolgirls: daily or weekly iron supplementation? Food and Nutrition Bulletin. 1999; 20(4): 429.
6. Family Health Bureau, Ministry of Health and Indigenous Medicines. Women health and development: country Profile. Colombo: Family Health Bureau, 2000 (unpublished).
7. Sri Lanka National Health System Profile, 2002, Government of Sri Lanka (p.2).
8. Atukorala TM, De Silva LD. Iron status of adolescent females in three schools of urban areas of Sri Lanka. Journal of Tropical Paediatrics. 1990 Dec; 36(6): 316-21.

**IRON DEFICIENCY ANAEMIA IN ADOLESCENTS
FACTSHEET**

THAILAND

THAILAND – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile¹

- Population = 64.3 million
- Adolescent population = 10.6 million (16.6%)
- Adolescent girls (10-19 years) = 5.2 million (49.6%)
- Adolescent girls in school (15-19 years) = 3.6 million (69.4%)

Anaemia prevalence

- No data available on prevalence of iron deficiency anaemia in adolescent girls
- Iron deficiency anaemia in reproductive age = 17.3%
- Iron deficiency anaemia (IDA) prevalence in pregnant women reduced from 30%-40% in 1986 to 15% during the 4th National Survey

Contributory causes of iron deficiency anaemia

- Rice based diet – poor bioavailability of iron
- Genetic haemoglobinopathies²
- Chronic inflammatory disorders
- Parasitic infection

Weekly Iron and Folic Acid Supplementation (WIFS) Thailand - Case Study³

- Place – Hat Yai rural area, Songkhla Province, Southern Thailand
- Subjects - 397 school children (6-13 years) from socio-economically disadvantaged community
- Prevalence of anaemia – 22.7% - 29.8%
- Treatment – Deworming (400 mg albendazole) at 0 and 12 weeks. Daily and weekly iron supplements (60 mg elemental iron) for 16 weeks under supervision
- Impact – Anaemia prevalence decreased from 27.8% to 0% in daily group and 29.8% to 0% in weekly group in 16 weeks.
- Conclusion – WIFS was superior to daily supplementation on IQ levels and cognitive functions

Source: 1, 2, 3,

Moving forward

A package of interventions is critical to build pre-pregnancy iron stores and for further reducing anaemia to < 10 %, as per the Eighth Economic and Social Development Plan. The interventions should include:

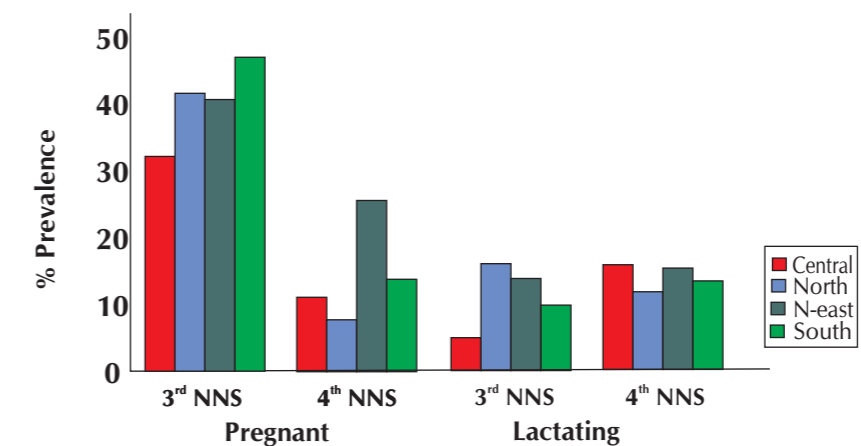
- Dietary diversification
- Deworming
- Introduction of WIFS in situations where anaemia prevalence is over 20% in girls; such

Such a reduction in anaemia will further accelerate reduction of MMR of 48 in 2008 to the MDG of 9 by 2015 (World Health Statistics, 2011).

Anaemia –A public health problem during adolescence

The National nutrition survey in Thailand indicates that anaemia prevalence among pregnant women (Figure I) has declined between the 1980s and 1990s. In the 3rd National nutrition survey of 1986, 30%-40% pregnant mothers were found to be anaemic and this reduced to 15% during the 4th national survey of 1996/97⁴. Today, 12 % of pregnant mothers are reported to be anaemic⁵. In a study of anaemia in women in the reproductive age group in North East Thailand, similar rate of anaemia prevalence of 17.3% has been reported⁶. The Eighth National Economic and Social development Plan⁷ aims to reduce anaemia among pregnant women and school children to <10%. Data on anaemia prevalence among adolescents is not available.

Figure I: Prevalence of anaemia by region among pregnant and lactating women from the 3rd and 4th National Nutrition Surveys (NNS)



In Thailand, rice contributes to 60%-70% of total energy intake. The proportion of non-heme iron is higher than heme iron, especially in rural Thai diets and absorption of iron is reported to be low from Thai meals^{8, 9}. Interestingly, some vegetables of Thai diet have been shown to strongly inhibit iron absorption¹⁰. The other contributory factors of anaemia are other micronutrient deficiencies, chronic inflammatory disorders and parasitic infections. In Thailand, as in many South East Asia countries, hereditary disorders affecting the production of haemoglobin are widespread².

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents

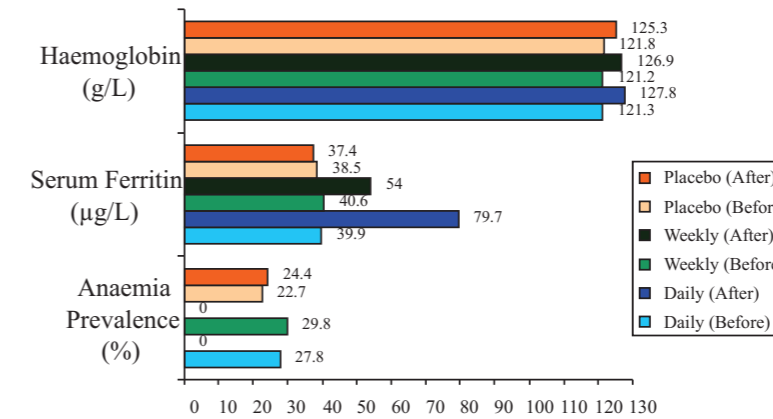
In Thailand, the effects of once-weekly and daily iron supplementation was studied in school children aged 6-13 years by Sungthong et al (2002)³. The impact of supplementation on haemoglobin, serum ferritin, and prevalence of anaemia, weight and height was studied in 397 school children from socio-economically disadvantaged communities of Hat Yai rural area, Songkhla Province, Southern Thailand.

All children received a single dose of 400 mg Albendazole at the beginning of the study and again after 11 weeks to eliminate hookworm infection. All children randomly received ferrous sulphate (300mg ferrous sulphate or 60 mg elemental iron per tablet) either daily or weekly or a placebo for 16 weeks. All oral administration was strictly observed to ensure consumption. Children with severe anaemia or with chronic illness such as thalassemia or haemolytic disease were excluded from this supplementation trial.

The mean of haemoglobin change in the daily and weekly supplemented groups was similar but both were greater than in the placebo group (Figure 2). The study demonstrated that weekly and daily supplements had similar impact in reducing anaemia. All children became non-anemic in the supplemented group, irrespective of daily or weekly supplementation. On the other hand, only one of the IDA children in the placebo group had improved serum ferritin but was anaemic while two children in the placebo group became anaemic. The study also indicated that a prolonged weekly dose of iron might eventually lead to adequate saturation of iron in blood and in tissue. Weekly dosage was, therefore, proven as effective as daily dose for reducing anaemia.

The impact of supplementation on intelligence quotient (IQ) levels and cognitive functions were also studied and reported in 2004. The results indicated weekly supplementation was superior to daily supplementation.

Figure 2: Changes in haematological variables and anaemia prevalence in school children given 300mg tablets of ferrous sulphate 5 days/week (daily) or 1 day/week (weekly) or a placebo for 16 weeks³



Preventing iron deficiency anaemia among adolescent girls - Moving forward

Thailand has made efforts to reduce prevalence of anaemia in its national development policies since the mid-1970s and iron deficiency anaemia has been included in the national goal (Table 1).

Table 1: Goals on anaemia in Thailand National Food and Nutrition Policy (NFP)

National development plan	Goals on anaemia in NFP
4th NESDP (1977-1981)	None (focused on PEM in young children)
5th NESDP (1982-1986)	Eradicate anaemia among pregnant and lactating women
6th NESDP (1987-1991)	Reduce prevalence of anaemia among pregnant women and school children to <20%
7th NESDP (1992-1996)	Reduce prevalence of anaemia among pregnant women and school children to <10%
8th NESDP (1997-2001)	Reduce prevalence of anaemia among pregnant women and school children to <10%

Universal iron supplementation is an integral part of antenatal care in the country⁴. A high priority is accorded to universal IFA supplementation programme through the existing community based antenatal care approach and the country's improved referral system for antenatal care as well as high institutional deliveries. However, less attention has been directed on building up iron stores prior to pregnancy and on preventive measures.

- Weekly iron supplementation to school children and to childbearing women at the workplace was planned to be included in the country programme in 2001⁴.
- Moreover, a routine reporting system for collecting haematocrit data of pregnant women and children was also included in the health plan with the intention of monitoring the anaemia situation

and reducing prevalence of anaemia in pregnant mothers and school children.

- Limitations in implementation of these programmes are of concern and it is considered desirable that a national representative sample survey is conducted periodically with the inclusion of other important groups, including adolescents for prevention of anaemia⁴.
- With current knowledge on benefits of weekly iron-folic acid supplementation, there is an urgent need to revisit and redefine the plan of action for reaching the goal of eradicating anaemia and building iron stores by inclusion of weekly supplements of iron-folic acid to adolescents and women in the reproductive age group.
- Strategies would need to go beyond a shift from dependency on the government health sector to active involvement of secondary schools and industry and the private sector in provision of supplements for the short term strategy and marketing of iron fortified food such as noodles and fish sauce for the long term.

References

1. World Health Organization, Regional Office of South-East Asia. Adolescent health – Thailand Factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.
2. Lipisaran S, Tienboon P, Promtet N, Putsyainunt P, Santawanpat S, Fuchs GJ. Iron Deficiency and anaemia in children with a high prevalence of khaemoglobinopathies: implications for screening. *International Journal of Epidemiology*. 1996 Dec; 25(6): 1262-6.
3. Sungthong R, Mo-suwan L, Chongsuvivatwong V, Geater AF. Once weekly is superior to daily iron supplementation on height gain but not on hematological improvement among school children in Thailand. *Journal of Nutrition*. 2002; 132: 418-22.
4. Winichagoon P. Prevention and control of anaemia: Thailand experiences. *Journal of Nutrition*. 2002; 132(suppl): 862S-866S.
5. Thailand, Ministry of Public Health. Thailand health profile 2001-2004. Bangkok, 2004.
6. Tungtrongchitr R, Pongpaew P, Schelp FP, Phonrat B, Mahaweerawat U, Paksanont S, Sanchaisuriya P, Jotking P, Intarakhao C, Saowakhontha S. Vitamin B12, Folic acid, Ferritin, haemoglobin in rural women in child bearing age in North East Thailand. *Journal of the Medical Association of Thailand*. 1997; 80: 785-89.
7. National Economic and Social Development Board. The eighth national economic and social development plan (1997-2001). Bangkok, 2001.

8. Hallberg L, Bjorn-Rasmussen E, Rossander L, Suwanik R. Iron absorption from Southeast Asia diets II: role of factors that may explain low absorption *American Journal of Clinical Investigation*. 1977; 30:539-548.
9. Tuntawiroon M, Sritongkul N, Rossander-Hulten L, Pleehachinda R, Suwanik R, Brune M, Hallberg L. Rice and iron absorption in man. *European Journal of Clinical Nutrition*. 1990; 44: 489-497.
10. Tuntawiroon M, Sritongkul N, Brune M, Rossander-Hulten L, Pleehachinda R, Suwanik R, Hallberg L. Dose dependent inhibitory effect of phenolic compounds in foods on non-heme iron absorption in men. *American Journal of Clinical Nutrition*. 1991; 53: 554-557.

**IRON DEFICIENCY ANAEMIA IN ADOLESCENTS
FACTSHEET**

TIMOR-LESTE

TIMOR-LESTE – PREVENTING IRON DEFICIENCY ANAEMIA AMONG ADOLESCENTS

Iron deficiency anaemia – A situation analysis

Population profile¹

- Population = 0.9 million
- Adolescent population = 0.2 million (25.1%)
- Adolescent girls (10-19 years) = 0.09 million (49%)
- Adolescent girls in school (15-19 years) = 0.05 million (60.4%)
- Adolescent girls out of school (15-19 years) = 0.02million (28.5%)

Anaemia prevalence

- No data available on prevalence of iron deficiency anaemia in adolescent girls

Contributory causes of iron deficiency anaemia

- Dietary data not available

Weekly Iron and Folic Acid Supplementation (WIFS) Timor - Leste Case Study

None

Moving forward

Integrating the WIFS programme for girls, in school and out of school in the health, education system and country policy, is essential for preventing anaemia, building prepregnancy iron stores and for achieving the MDG of reducing MMR of 370 in 2008 to 252 by 2015 (World Health Statistics, 2011).

Source: 1, 2,

Anaemia –A public health problem during adolescence

Data on prevalence of anaemia among adolescents and women in the reproductive age group has not been reported.

Weekly iron and folic acid supplementation (WIFS) is effective in preventing iron deficiency anaemia in adolescents

(Note– Efficacy trials not reported from Timor-Leste)

Preventing iron deficiency anaemia among adolescent girls - Moving forward

Health and Nutrition Profile – MDGs^{2,3,4}

Indicator	1990	2000	2005	2009	2015
IMR		88	98	48	53
U5MR		125	130	56	96
Underweight		45	NA		31
LBW			10 (2003)*		
MMR		NA	420-800	370*	252

* 2008

References

1. World Health Organization, Regional Office for South-East Asia. Adolescent health – Timor Leste factsheet. In: Adolescent health at a glance in South – East Asia Region. New Delhi: WHO-SEARO, 2007.
2. World Health Organization, Regional Office for South-East Asia. 11 health questions about the 11 SEAR countries. New Delhi: WHO-SEARO, 2007.
3. UNICEF. State of the world's children 2005: childhood under threat. New York, 2005.
4. World Health Organization, World Health Statistics, 2011.