

RECOMMENDATIONS


National expert group technical consultation on prevention and treatment of iron deficiency anemia

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Abstract	Introduction	Methodology	Results	Conclusion	References	Citation	Tables / Figures
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Citation

Sachdev HPS, Kurpad A, Saxena R, Kapil U. National expert group technical consultation on prevention and treatment of iron deficiency anemia. Indian J Comm Health. 2018; 30, Supp: I-XI.

Source of Funding: Nil **Conflict of Interest:** None declared

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Recommendations

A "National Expert Group Technical Consultation on Prevention and Treatment of Iron Deficiency Anemia" was held from 23rd to 24th April 2018 at All India Institute of Medical Sciences, New Delhi. The Consultation was conducted under the aegis of Ministry of Health and Family Welfare, Government of India. The following were the Co-organizers i) Departments of Human Nutrition and Hematology, All India Institute of Medical Sciences, New Delhi; ii) Sitaram Bhartia Institute of Science and Research (SBISR), New Delhi; iii) Public Health Foundation of India (PHFI), iv) Nutrition Society of India (NSI), v) Indian Association of Preventive and Social Medicine (IAPSM), vi) Indian Academy of Pediatrics (IAP) Nutrition Sub-specialty Chapter, vii) Federation of Obstetric and Gynecological Societies of India (FOGSI), viii) Indian Public Health Association (IPHA), ix) Indian Society of Haematology and Blood Transfusion (ISHBT), x) International Epidemiological Association - South East Asia Region (IEA-SEA), xi) Alive and Thrive India, xii) Knowledge Integration and Translational Platform (KnIT – BIRAC-DBT), and xiii) World Health Organization (WHO).

The **objectives** of the Consultation were to discuss the cumulative scientific and epidemiological evidence, with respect to the current WHO recommendations, on benefits and safety of administration of iron to six vulnerable groups: i) infants, ii) preschool children, iii) school children aged 5-10 years, iv) adolescent boys and girls aged 10-19 years, v) women of reproductive age, and vi) pregnant and lactating women, and to provide evidence based guidelines to the Ministry of Health and Family Welfare, Government of India, for future direction with respect to the National Iron Plus Initiative (NIPI) for prevention and control of Anemia.

The executive summary of current WHO Guidelines 2016 for the Prevention of Anemia are given in [Table 1](#). The Scientific Program of the Consultation is provided in [Table 2](#).

The consultation followed a participative and transparent approach, comprising of presentations of relevant scientific evidence, remarks by a lead discussant, discussion among all participants, followed by the development of a consensus. The list of Invitees and participants is provided in [Table 3](#).

Consensus was reached on the following specific aspects:

- a. Prophylactic and treatment iron dose for pregnant women and other age groups
- b. Use of Enteric coated tablets
- c. Use of Hemoglobin estimation techniques
- d. The benefits and risks of fortification

Introduction

The National Anemia Prophylaxis Program (NAPP) to address anemia in India was launched in 1971. At the time of initiation, the recommended prophylactic dosage was 60 mg elemental iron per day for pregnant women. Based on the Indian Council of Medical Research (ICMR) evaluation of NAPP and findings of the ICMR research studies on iron dosage levels, a national Consultation was held in the year 1989, which recommended an increase in elemental iron dosage to 100 mg per day. The program was renamed "Anemia Control Program". In 2013, the Anemia Control Programme was renamed as National Iron Plus Initiative (NIPI) programme. The programme has been expanded to cover all vulnerable age groups. Anemia Mukht Bharat was launched in April 2018 to intensify the implementation of NIPI programme.

This National Expert Group Technical Consultation discussed emerging scientific evidence on doses, frequency and duration of Iron supplementation during the past three decades. The Iron dosage used in the Government of India (NIPI program 2013 and Anemia Mukht Bharat 2018) as well as the WHO recommendation made in 2016 were presented and discussed. Programmatic issues related to NIPI were not discussed since it was beyond the scope and focus of the consultation. The Expert Group agreed that the dosage of elemental iron to be used in future in the NIPI program should consider an approach that balanced "benefits and risks".

Recommendation**1. Pregnant Women: Prevention of Anemia**

Pregnant women should be encouraged to improve their overall nutrition. Principles of consuming a balanced diet, with diversification in food items to improve bioavailability of ingested iron, are necessary.

The recommended dose of iron supplementation for prevention of anemia in pregnant women is 60 mg elemental iron along with 500 microgram folic acid, as a single daily dose of one sugar coated tablet. The tablet should preferably be consumed after meals, to reduce chances of discomfort. Supplementation

should commence after the first trimester, around 14–16 weeks of gestation until delivery.

2. Pregnant Women: Treatment of Anemia

In pregnant women with Hemoglobin ranging between 7 and 10.9 gm/dL (moderate or mild anemia), the recommended dose of iron supplementation is 120 mg elemental Iron along with 1000 microgram Folic acid, as a single daily dose of two sugar coated Iron Folic Acid (IFA) tablets, with each tablet containing 60 mg elemental Iron and 500 microgram Folic Acid. The tablets should preferably be consumed after meals, to reduce chances of discomfort.

The Hemoglobin level should be rechecked at the follow up Antenatal Care visit to determine the continuation of treatment dose or to shift to the prophylactic dosage as outlined in the above section. Pregnant women with hemoglobin below 7 gm/dL (severe anemia) should be urgently referred to health facilities.

3. Lactating Women: Prevention of Anemia

Lactating women should be encouraged to improve their overall nutrition. Principles of consuming a balanced diet, with diversification in food items to improve bioavailability of ingested iron, are necessary.

The recommended dose of iron supplementation for prevention of anemia in lactating women is 60 mg elemental iron along with 500 microgram folic acid as a single daily dose of one sugar coated tablet. The tablet should preferably be consumed after meals, to reduce chances of discomfort. Supplementation should commence immediately after delivery and continue for a minimum period of 180 days post-partum.

4. Lactating Women: Treatment of Anemia

In lactating women with Hemoglobin ranging between 8 and 11.9 gm/dL (moderate or mild anemia), the recommended dose of iron supplementation is 120 mg elemental Iron along with 1000 microgram Folic acid as a single daily dose of two sugar coated IFA tablets, with each tablet containing 60 mg elemental Iron and 500 microgram Folic Acid. The tablets should preferably be

consumed after meals, to reduce chances of discomfort.

The Hemoglobin level should be rechecked at the follow up Postnatal Care visit to determine the continuation of treatment dose or to shift to the prophylactic dosage as outlined in the above section. Lactating women** with hemoglobin below 8 gm/dL (severe anemia) should be referred to health facilities.

** There is no Hemo-dilution, hence the Hb Cut Off is same as that of Women of Reproductive Age

5. Women of Reproductive Age (WRA): Prevention of Anemia

The recommended dose of iron supplementation for prevention of anemia in WRA is 60 mg elemental iron along with 500 microgram of folic acid, as one sugar coated tablet taken as a weekly dose throughout the year.

6. Women of Reproductive Age (WRA): Treatment of Anemia

In WRA with Hemoglobin ranging between 8 and 11.9 gm/dL (moderate or mild anemia), recommended dose of iron supplementation is 120 mg elemental Iron along with 1000 microgram Folic acid for 90 days, as a single daily dose of two sugar coated IFA tablets, with each tablet containing 60 mg elemental Iron and 500 microgram Folic Acid. The tablet should preferably be consumed after meals, to reduce chances of discomfort. The Hemoglobin level should be rechecked after 90 days of commencing treatment to determine the continuation of treatment dose or to shift to the prophylactic dosage as outlined in the above section.

WRA with hemoglobin below 8 gm/dL (severe anemia) should be referred to health facilities.

7. Adolescent boys and girls (10-19 years): Prevention of Anemia

The ongoing Weekly Iron Folic-Acid Supplementation (WIFS) program in India is based on the efficacy trials and pilot projects undertaken in selected states in early 2000. Contemporary scientific evidence on the effect of varying dosage of elemental iron on hemoglobin and Ferritin levels, administered weekly or daily was presented, and showed no difference between these treatments. Compliance and supervision issues of weekly IFA administration with IFA tablets containing 100 mg elemental iron dosage in school situation were discussed. It was pointed out that supervised administration of IFA under WIFS program can reach school children for about 24 -26 weeks out of 52 weeks in a year due to: i) summer

and winter vacations, ii) half yearly and annual examinations, and iii) Government holidays. The logistics of administering IFA for three consecutive months were discussed. Notwithstanding the possibility that the WIFS program may only administer about half of the recommended IFA doses, it was suggested that the program is now being successfully implemented with a lot of effort, and having gradually matured over the last few years, it should continue in the same manner. It was submitted that a lot of investment in terms of advocacy and resources has been made. Hence, currently there is no need to change the basic contours of the ongoing program and weekly administration of IFA tablets to adolescents should continue as on going.

The recommended dose of iron supplementation for prevention of anemia in adolescent boys and girls (10-19 years) is 60 mg elemental iron along with 500 microgram of folic acid, as one sugar coated tablet, taken as a weekly dose throughout the year. The tablet should preferably be consumed after meals, to reduce chances of discomfort.

8. Adolescent boys and girls (10-19 years): Treatment of Anemia

In adolescent boys and girls (10-19 years) with moderate or mild anemia, the recommended dose of iron supplementation is 120 mg elemental Iron along with 1000 microgram Folic acid for 90 days.

The Hemoglobin cut off's for defining moderate or mild anemia are as follows:

- i) For 10-11years Adolescent Boys and Girls Hemoglobin ranging between 8 and 11.4 gm/dL
- ii) For 12-14 years Adolescent Boys and Girls Hemoglobin ranging between 8 and 11.9 gm/dL
- iii) For 15-19 years Adolescent Boys Hemoglobin ranging between 8 and 12.9 g/dL
- iv) For 15-19 years Adolescent Girls Hemoglobin ranging between 8 and 11.9 g/dL

The tablet should preferably be consumed after meals, to reduce chances of discomfort. The Hemoglobin level should be rechecked after 90 days of commencing treatment to determine the continuation of treatment dose or to shift to the prophylactic dosage as outlined in the above section. Adolescents with hemoglobin below 8 gm/dL (severe anemia) should be referred to health facilities.

9. School children aged 5- less than 10 years: Prevention of Anemia

The recommended dose of iron for prevention of anemia in school aged children (5-10 years) is 45 mg elemental iron along with 400 microgram folic acid, administered as a sugar coated tablet in a weekly dose, to be given throughout the year. The tablet should preferably be consumed after meals, to reduce chances of discomfort.

10. School Children aged 5- less than 10 years: Treatment of Anemia

In children (5- <10 years) with mild (Hb 11-11.4 gm/dL) or moderate (Hb 8-10.9 gm/dL) anemia, the recommended dose of iron is 3 mg/kg/day of elemental Iron, as a daily single dose for 60 days. The tablet should preferably be consumed after meals, to reduce chances of discomfort. The Hemoglobin level should be rechecked after 60 days of commencing treatment to determine the continuation of treatment dose or to shift to the prophylactic dosage as outlined in the above section.

Children with hemoglobin below 8 gm/dL (severe anemia) should be referred to health care facilities.

11. Children aged 24 – 59 months: Prevention of Anemia

The recommended dose of iron supplementation for prevention of anemia in children aged 24-59 months is 20 mg elemental iron along with 100 microgram folic acid, taken as a bi-weekly dose throughout the year, each year till five years of age. The syrup should preferably be given after meals, to reduce chances of discomfort.

12. Infants aged 6-23 months: Prevention of Anemia.

The recommended dose of iron supplementation for prevention of anemia in infants aged 6-23 months is 20 mg elemental iron along with 100 micrograms folic acid, as a bi-weekly dose, to be given throughout the year till two years of age. The syrup should preferably be given after meals, to reduce chances of discomfort.

Preterm and low birth weight infants below six months of age should be referred to a medical officer for determining the dose and duration of iron supplementation.

13. Children aged 6-59 months: Treatment of Anemia

In 6-59 months old children with moderate (Hb 7-9.9 gm/dL) or mild (Hb 10-10.9 gm/dL) Anemia, the recommended dose of iron supplementation is 3 mg/kg/day of elemental Iron, as a daily dose for 60 days, to be consumed at one time per day after a meal. The Hemoglobin level should be rechecked

after 60 days of commencing treatment to determine the continuation of treatment dose or to shift to the prophylactic dosage as outlined in the above section. The syrup should preferably be given after meals, to reduce chances of discomfort.

Children with hemoglobin below 7 gm/dL (severe anemia) should be referred to health facilities.

14. Enteric Coated Tablets

It was noted that the absorption of iron is best in the upper part of the duodenum, where the presence of acid from the stomach helps the absorption. The absorption of iron from enteric coated tablets, where the iron is delivered to lower parts of the intestine, is likely to be poor. A Clinical Trial, using state-of-the-art stable isotopic methods, conducted at St John's Medical College, Bangalore, on the relative absorption of iron from enteric vs non-enteric coated tablets, in iron-deficient Indian women, was presented. The absorption of iron from enteric coated tablets was substantially lower than that from non-enteric coated tablets (4.3% versus 12.1%). It is to be noted that this absorption was measured with a neutral meal, that is, a meal that has relatively low inhibitors of iron absorption. It is likely that with a highly inhibitory meal (with phytates and polyphenols), as is generally eaten in India, the absorption would be even lower. It was noted that IFA tablets with "no-coating" are best absorbed but have low acceptability due to poor appearance and taste. Sugar coated IFA tablets are more acceptable. It was recommended that only sugar coated IFA tablets should be used above 59 months of age in the NIPI/ Anemia Mukt Bharat Program.

Enteric coated tablets should not be utilized due to poor bioavailability of iron.

15. Double (Iodine and Iron) Fortified Salt

Efficacy trials of Double Fortified Salt (DFS) have been done in the country while effectiveness trials are currently underway. DFS is being supplied through the Public Distribution System (PDS) at a subsidized rate in three states currently (Uttar Pradesh, Jharkhand, and Madhya Pradesh).

The subsidized PDS cost varies from INR 1 – INR 6 per kg. The expert Group was informed that technically there is no problem in doubling the concentration of the iron fortificant, if average salt consumption is recommended to be reduced from 10 to 5 gm / day. It was agreed that daily intake of 10 grams of DFS provides an additional 10 mg of elemental iron to the dietary intake. DFS therefore has the potential to increase the daily intake of iron and contribute to

reducing the existing gap of dietary iron intake in comparison to the recommended dietary allowance (RDA). It was recommended that long term studies on impact and safety of DFS consumption should be undertaken. Also, the potential for excessive intake of iron should be evaluated considering additional sources of food fortification in the PDS (wheat and rice).

16. Methods of Hemoglobin estimation

The Hemocue method does not provide values that are similar to the gold standard (auto-analyzer based on cyanmethemoglobin method or direct cyanmethemoglobin method) using venous sampling method as both systematic and random errors occurs.

Experiences gained from National Nutrition Monitoring Bureau, District Level Household Surveys (2 and 4) and Annual Health Surveys regarding use of dried blood spot based indirect cyanmethemoglobin estimation were not discussed.

Logistic issues also need to be considered prior to recommending a method for hemoglobin estimation for national surveys.

The accuracy and reliability of estimates for Point of Care devices used for estimation of hemoglobin are influenced by collection technique, hemodilution effect, differences due to specific instruments used, and blood sampling methods.

It was recommended that the Sahli's or Color Scale method should not be utilized for hemoglobin testing.

Tables

TABLE 1 WHO RECOMMENDATIONS

	Pregnant Women	Lactating Women	WRA	Adolescent girls (12-19y)	School children (5-10 y)	Children (24-59 mo)	Infants (6-23 mo)
Dose	30 - 60 mg elemental iron and 400 µg folic acid Dose of 60mg should be given when prevalence of anemia is ≥ 40%	30 - 60 mg elemental iron and 400 µg folic acid	30 - 60 mg elemental iron and 400 µg folic acid	30 - 60 mg elemental iron	30 - 60 mg elemental iron	30 mg elemental iron	10 - 12.5 mg elemental iron
Frequency	Daily	Daily	Daily	Daily	Daily	Daily	Daily
Duration	Throughout pregnancy	6-12 weeks post-partum	3 consecutive months (90 days)	3 consecutive months (90 days) in a year	3 consecutive months (90 days) in a year	3 consecutive months (90 days) in a year	3 consecutive months (90 days) in a year

WRA: Women of reproductive age
Taken from WHO 2016, Guidelines for daily iron supplementation

TABLE 2 SCIENTIFIC PROGRAM

“NATIONAL EXPERT GROUP TECHNICAL CONSULTATION ON PREVENTION AND TREATMENT OF IRON DEFICIENCY ANEMIA”			
DATE: 23RD TO 24TH APRIL 2018			
VENUE: DR. RAMALINGASWAMY BOARD ROOM			
ALL INDIA INSTITUTE OF MEDICAL SCIENCES, NEW DELHI, INDIA			
SCIENTIFIC SESSION No.	TIME	TOPIC	SPEAKER
	DATE: 23RD APRIL 2018		
	09:00-10:00	Registration and Welcome Tea	
1	INAUGURAL SESSION		
	10:00-10:05	Welcome	Dr. Renu Saxena, AIIMS, New Delhi
	10:05-10:15	Objectives of the National Consultation	Dr HPS Sachdev, Sitaram Bhartia Institute of Science and Research, New Delhi
	10:15-10:25	Address to the Experts of the National Consultation	Ms Vandana Gurnani, Joint Secretary, MOHFW, New Delhi
	10:25-10:35	Address to the Experts of the National Consultation	Dr. Balram Bhargava, Secretary, Department of Health Research and Director General, ICMR, New Delhi
	10:35-10:45	Address to the Experts of the National Consultation	Dr. Henk Bekedam, WHO Representative to India.

			New Delhi
	10:45-10:55	Address to the Experts of the National Consultation	Dr. Randeep Guleria, Director, AIIMS, New Delhi
	10:55-11:10	Inaugural Address	Prof. Vinod Paul, Member, NITI Aayog, New Delhi
	11:10-11:15	Vote of Thanks	Dr. Umesh Kapil, AIIMS, New Delhi
	11:15-11:30	INAUGURAL TEA	
		Day - I : Chairpersons	
		i) Dr. Sila Deb, Deputy Commissioner, MOHFW, New Delhi	
		ii) Dr Ajay Khera, New Delhi	
		iii) Dr H.P.S. Sachdev, Consultant, New Delhi	
		iv) Dr. Renu Saxena, AIIMS, New Delhi	
2	11:30-11:45	Introduction to Development Process of WHO Guidelines	Dr. Juan Pablo, WHO, Geneva, Switzerland
3	11:45-12:10	Recent Scientific Evidence on Iron Absorption, Metabolism and Adverse Effects	Dr Anura Kurpad Prof & Head, Department of Physiology, St. John's Medical College, Bangalore-560 034
4	12:10-12:20	National Guidelines on Prevention and Treatment of Anaemia amongst Pregnant Mothers	Dr. Sila Deb Deputy Commissioner, MOHFW, New Delhi
5	12:20-12:30	Global Guidelines on Prevention and Treatment of Anaemia amongst Pregnant Mothers	Dr. Juan Pablo, WHO, Geneva, Switzerland
6	12:30-12:40	National Guidelines on Prevention and Treatment of Anaemia amongst Lactating Mothers	Dr. Sila Deb Deputy Commissioner, MOHFW, New Delhi
7	12:40-12:50	Global Guidelines on Prevention and Treatment of Anaemia amongst Lactating Mothers	Dr. Juan Pablo, WHO, Geneva, Switzerland
	12:50-13:10	Discussant	Dr. K. Madhavan Nair, Former Scientist G, National Institute of Nutrition, Hyderabad
	13:10-14:00	Discussions and Clarifications on the Global and National Guidelines AND Finalization of Recommendations for Pregnant and Lactating Mother	All Participants
	14:00-14:30	LUNCH	
8	14:30-14:40	National Guidelines on Prevention and Treatment of Anemia amongst Women in Reproductive Age Group	Dr. Sila Deb Deputy Commissioner, MOHFW, New Delhi
9	14:40-14:50	Global Guidelines on Prevention and Treatment of Anemia amongst Women in Reproductive Age Group	Dr. Angela de Silva, WHO Regional Office – India New Delhi
	14:50-15:10	Discussant	Dr. K. Madhavan Nair, Former Scientist G, National Institute of Nutrition, Hyderabad
	15:10-15:40	Discussions and Clarifications on the Global and National Guidelines AND Finalization of Recommendations for Women in Reproductive Age Group	All Participants
	15:40-16:00	TEA	
10	16:00-16:20	Double Fortified Salt in India: Coverage, Efficacy and Way Forward	Dr. Venkatesh Mannar, University of Toronto, Canada
11	16:20-16:35	Point of Care Device for Haemoglobin Estimation in Large Surveys	Dr. Sumathi Swaminathan, St. John's Research Institute, Bangalore
12	16:35-16:50	Point of Care Device for Haemoglobin Estimation in Large Surveys	Dr. Renu Saxena, AIIMS Dr. Sutapa B. Neogi, PHFI, Gurgaon
	16:50-17:10	Discussant	Dr. Kapil Yadav AIIMS (10 Minutes) Dr. Preetam Mahajan (10 Minutes)
	17:10-17:30	Discussion and Finalization of Recommendations	All Participants
	DATE: 24TH APRIL 2018		
	09:00-09:30	WELCOME TEA	
		Day - II : Chairpersons	
		i) Dr Sushma Dureja, Deputy Commissioner, MOHFW, New Delhi	
		ii) Dr Sila Deb, Deputy Commissioner, MOHFW, New Delhi	
		iii) Dr. Ajay Khera, New Delhi	
		iv) Dr Anura Kurpad Prof & Head, Department of Physiology, St. John's Medical College, Bangalore-560 034	
		v) Dr. Prema Ramachandaran, Nutrition Foundation of India	
13	09:30-09:40	Summary of Proceedings of Day-I	Dr. Sheila Vir, Director, Public Health Nutrition and Development Centre, New Delhi

14	09:40-10:00	National Guidelines on Prevention and Treatment of Anaemia amongst Adolescent Girls (Dose and Frequency)	Dr Sushma Dureja, Deputy Commissioner, MOHFW, New Delhi
15	10:00-10:20	Global Guidelines on Prevention and Treatment of Anaemia amongst Adolescent Girls (Dose and Frequency)	Dr. Rajesh Mehta, WHO-SEARO Office, New Delhi
	10:20-10:40	Discussant	Dr. K. Madhavan Nair, Former Scientist G, National Institute of Nutrition, Hyderabad
	10:40-11:20	Discussions AND Finalization of Recommendations on Iron Doses for Adolescent Girls	All Participants
	11:20-11:35	TEA	
16	11:35-11:50	Suitability of Enteric Coated Iron Folic Acid Tablets in a National Programme: Results of a Comparative Clinical Trial	Dr. Prashant Thankachan St. John's Research INstitute, Bangalore
17	11:50-12:05	Suitability of Enteric Coated Iron Folic Acid Tablets in a National Programme: A Pharmacologist Point of View	Prof Bikash Medhi, Department of Pharmacology, PGIMER, Chandigarh
	12:05-12:30	Discussions AND Finalization of Recommendations on Suitability of Enteric Coated Tablets in National Anemia Control Programme	All Participants
18	12:30-12:40	National Guidelines on Prevention and Treatment of Anaemia amongst i) Under Five Children	Dr. Sila Deb Deputy Commissioner, MOHFW, New Delhi
19	12:40-12:50	Global Guidelines on Prevention and Treatment of Anaemia amongst i) Under Five Children	Dr. Juan Pablo, WHO, Geneva, Switzerland
20	12:50-13:00	National Guidelines on Prevention and Treatment of Anaemia amongst Children in 6-10 Years of Age	Dr. Sila Deb Deputy Commissioner, MOHFW, New Delhi
21	13:00-13:10	Global Guidelines on Prevention and Treatment of Anaemia amongst Children in 6-10 Years of Age	Dr. Juan Pablo, WHO, Geneva, Switzerland
	13:10-13:30	Discussant	Dr. K. Madhavan Nair, Former Scientist G, National Institute of Nutrition, Hyderabad
	13:30-14:00	LUNCH	
	14:00-15:00	Discussions and Finalization of Doses of Iron for i) Children Under Five and ii) Children in 6-10 Years of Age	All Participants
	15:00-15:15	TEA	
22	15:15-15:35	Key Research Priorities to Combat Iron Deficiency Anemia	Dr. Anju Sinha, Scientist 'E' (Deputy Director General), ICMR, New Delhi
23	15:35	Valedictory/Concluding Session	Chief Guest Ms. Vandana Gurnani Joint Secretary, MOHFW, New Delhi
		Presentation of Recommendations of National Consultation	Dr. Sheila Vir, Director, Public Health Nutrition and Development Centre, New Delhi

LIST OF INVITEES AND PARTICIPANTS

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