



# **Maternal and Child Nutrition**

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# Maternal nutrition

- Poor foetal growth in developing countries is largely attributed to widespread maternal undernutrition
- About 36% of women in India in the reproductive age have BMI < 18.5 Kg/m<sup>2</sup> – the cut off for undernourishment
- Poor maternal nutritional status at conception and low dietary intakes during gestation } poor weight gain & birth weight





# Maternal diets

- Maternal diets are inadequate in both macro and micronutrients
- Macronutrients are better studied as interventions based on energy & protein are implemented in many countries
- Micronutrients are relatively less studied



## Indian studies show

- Multiple micronutrient deficiencies exist due to inadequate food intake, poor dietary quality, poor bioavailability or a combination of these factors.
- In contrast, most intervention trials consider only one or two micronutrients (iron & folic acid)
- Maternal diets grossly inadequate in functional foods



# Maternal nutritional status

- Socio economic factors-
- Childhood undernutrition
- delayed adolescent growth
- early age at marriage & at conception
- Low maternal intakes throughout gestation
- Higher energy expenditure
- Poor pregnancy outcome – Maternal mortality, pregnancy wastage, still birth, Low birth weight
- The baby girl continues the vicious cycle

The only modifiable factor is maternal intakes & energy (?)

# Maternal nutrition

- **Macronutrients** –

- 1) **Supplementation** energy & protein rich food – programs like ICDS – are they effective (?) / how much mean birth weight increased in last 30 yrs (?)
- 2) **Fortification** of foods – cost effective ( ? ), enough resources available (?) acceptance (?)
- 3) **Create awareness** – advise to eat 1 roti/ bhakri extra every day during gestation, advise to have cereal +pulse mixture for making roti than using one cereal, advise to add only 10% soybean to roti mix – will ensure higher and better quality proteins (but no RCT's to examine such issues)

Need for reducing energy expenditure too.

**Simple solutions, more acceptance, sustainable, need to be tested through scientific studies**



# Activities of rural women



Removing  
weeds



Harvesting



Brick  
kills



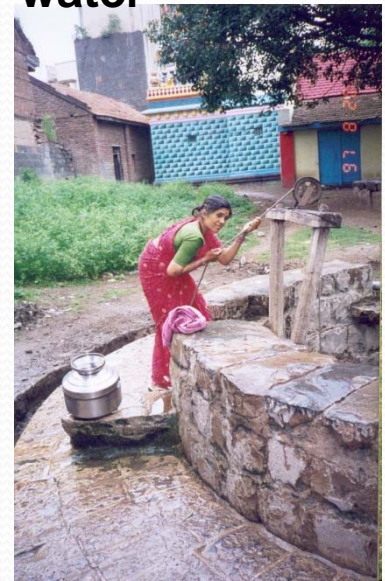
Washing  
cloths



Washing  
cloths



Fetching  
water






## Examining effects of maternal diet Vs single nutrient on birth size

- For example, **Fish consumption** → increase in gestation & birth size  
(Olsen SF, et al Lancet 1986, 2:367-369. Am J Obstet Gynecol 1991, 164:1203-1209, Br J Nutr 1995, 73:397-404)
- **Intra uterine growth might be improved by adopting certain dietary patterns** (Knudsen et al , EJCEN 2008)
- We have shown that **dietary diversification can reduce prevalence of anemia by half in rural mothers** (Rao et al - PHN 2013)
- Mothers consuming **millets on daily basis** had significantly higher ALA ( $p = 0.023$ ), EPA ( $p = 0.002$ ), DHA ( $p = 0.000$ ) and had lower risk of prematurity.  
(Prachi Ranade & Shobha Rao: Functional Foods in Health and Disease, 2012, 2(11), 414-27.)



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- In undernourished populations it may be difficult to improve maternal nutritional status in a short period of time but **modifying diet within the socio-cultural frame** work is possible and may provide sustainable approach to improve birth size.
  - Associations of maternal diet with birth size are of immense importance

## Micronutrients

### Prevention of anemia - major public health problem

- **Iron deficiency** – leading micronutrient deficiency
  - affects > 2 billion persons across the world
  - continues to be a major public health problem in nearly all the developing countries
  - prevalence in different states range 33% - 89% (Toteja et al FNB 2008)
  - **NACP in operation in India over 30 yrs**
  - major impact on pre maturity & birth weight (?)



# Reasons for not getting desirable results from NACP

- Large scale programs suffer from ,
  - insufficient & inconsistent supply of tablets
  - insufficient counseling on the need for & benefits of iron supplementation
  - side effects of iron tablets (though are small )
  - unwillingness of pregnant women to take the tablets
  - Difficulties in reaching target population
  - Health staff not adequately motivated for effective distribution of tablets
  - High prevalence of infections (Malaria) and worm infestation

# Dietary interventions

- Approach should be for **dietary modification** rather than supplementation
- Will provide combinations of various micronutrients, unlike synthetic tablet.
- Demands improving knowledge & awareness of the target population
- The entire family can be benefited rather than a targeted subject.



# Live demonstrations of recipes



**Live  
Demonstration**

←  
**and tasting**

→  
**of recipes**



**Distribution of  
GLV bunch**

←  
**and handouts**



**For encouraging to repeat the demonstrated recipe at home**



# Promotion of kitchen garden activity



**Distribution of seedlings – motivation for kitchen garden**

**Simple methods of**

**Cultivating for  
landless families**



**Contract farming**

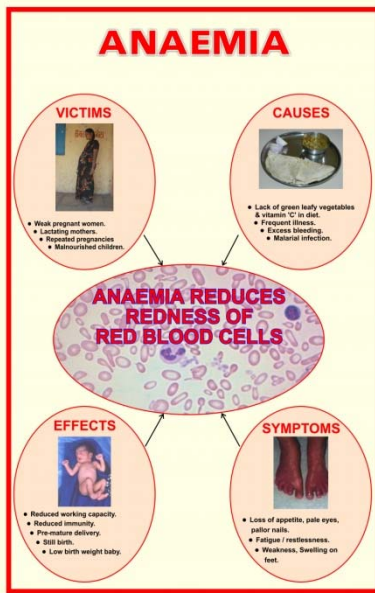


Besides live demonstrations,

recipes were pictorially depicted in the form of a calendar

and finally in the book form and were given to each woman enrolled in the study


Brief information on anemia, its symptoms & adverse effects on birth size in the form of a calendar were given to each women



## II) Formulation & live demonstration of iron rich recipes

- Development of iron rich recipes & their live demonstrations
- GLV as well as non-GLV sources
- Procedures of food preparation
- Along with iron consider vit. C, Calcium, Folic acid &  $\beta$ -carotene



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- **Our work documented potential benefits of community based approach in combating major public health problem of anaemia**
  - **it is likely to offer spin-off effects on iron status of other family members ( young children, elderly adolescents etc.) being food based intervention**
  - **The approach may serve as role model for tackling other problems in rural India**

**eg. 1) weaning foods to combat PEM in children < 3 yrs**  
**2) Vit. A deficiency in young rural children**

# Importance of micronutrients

- We have earlier shown in Pune Maternal Nutrition Study on rural mothers (n=633) that frequency of consumption of milk, GLVs & fruits was significantly associated with size at birth  
(Rao et al- J Nutr 2001)
- Are there certain combinations of micronutrients that have beneficial effects for foetal growth?



## Results of Principle Component Analysis

Micronutrient	18 <sup>th</sup> week		28 <sup>th</sup> week	
	Component I	Component II	Component I	Component II
Iron	<b>0.943</b>		0.944	
Omega	0.940		<b>0.947</b>	
Riboflavin	0.837		0.877	
Carotene	0.772		0.813	
Vit. C		<b>0.804</b>		<b>0.835</b>
Folic acid		0.788		0.781
Calcium		0.736		0.749
% of variance	<b>53.7</b>	<b>22.1</b>	<b>55.1</b>	<b>22.9</b>

**Variation in consumption of foods is explained more by component I i.e. most of foods consumed had these micronutrients .**

**PCA allocates factor scores to these components so that they can be used in regression analysis as independent components.**

# Results of MLRA

Dependent variable	18 <sup>th</sup> week			28 <sup>th</sup> week		
	R <sup>2</sup>	Compo. I β	Compo. II β	R <sup>2</sup>	Compo. I β	Compo. II β
Birth weight	23.3	16.7±12.7	26.9±12.8 **	23.8	5.9±12.8	36.9±12.8 **
Length	21.8	0.087±0.07	0.16±0.07 **	21.5	0.08±0.07	0.12±0.07
Head circum	25.9	0.025±0.04	0.153±0.04 **	25.8	-0.005±0.04	0.12±0.04 **
Tric skinfold	6.5	0.004±0.008	0.002±0.008	8.2	0.01±0.008	0.02±0.008 **
Subscapular	6.6	0.008±0.008	-0.004±0.008	7.4	0.02±0.008*	0.01±0.008
Mid arm	11.3	0.07±0.03*	0.02±0.03	11.0	0.03±0.03	0.06±0.03
Abdominal Circum	9.7	0.04±0.07	0.14±0.07	10.7	0.01±0.07	0.20±0.07 **
Plac weight	7.2	3.8±3.1	4.4±3.1	7.5	6.2±3.1	6.7±3.2 **

## Component I

Iron  
Omega 3 fa  
Riboflavin  
Carotene

## Component II

Vit. C  
Folic acid  
Calcium

It is more influential at early as well as late gestation



# Our observations suggest,

- Foods rich in calcium, vit.C and folic acid are important throughout gestation for improving birth size
- Drinking milk during pregnancy can be promoted
- Promoting use of lemon in daily diet is feasible and will have multiple benefits
- Consumption of seasonal fruits rich in vit C (guava, raw tamrind, zizapus, amla etc) can be promoted.
- These simple modifications of rural maternal diet are feasible, sustainable and cost effective for improving birth size in rural India

# Can technology help ?

- Develop protein rich roti mix using appropriate cereals pulses and millets, standardise , involve Self Help Groups, train and help them for production of such mixtures.
- Development of weaning foods, also rich in micronutrients  
Cases of night blindness is still present in almost every village
- Simple food dehydrators /solar driers to preserve green leafy vegetables and seasonal fruits when they are available in plenty and use throughout the year.
- Taking technology to people –an approach that would be sustainable.





Thank you!