NUTRITION FOUNDATION OF INDIA

ANAEMIA IN PREGNANCY - INTERSTATE DIFFERENCES

By

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College of Home Science, Assam Agricultural University,	Dr M.C. Kalita
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Preface

Anaemia in pregnancy accounts for one fifth of maternal deaths and is a major factor responsible for low birth weight. The National Anaemia Prophylaxis Programme has been in operation since 1973. In the nineties, several small studies have reported that there is no reduction in prevalence or adverse effects due to anaemia in pregnancy.

The National Family Health Survey–2 (NFHS), the first nationwide survey on anaemia, had reported that the prevalence of anaemia in pregnancy was only 50%. The Department of Family Welfare, Government of India commissioned NFI to undertake a study in the villages where NFHS had conducted the study to assess whether there has been a steep decline in the prevalence of anaemia in pregnancy, and also ascertain factors responsible for interstate differences.

This report presents the data from the study on prevalence of anaemia in pregnancy in seven states. Data from this study showed that, contrary to the NFHS report, the prevalence of pregnancy anaemia in India continues to be high. The lower prevalence reported in NFHS-2 was most probably attributable to the method used for Haemoglobin estimation (Hemocue method as against the conventional Cyanmethaemoglobin method). Interstate differences were partly due to differences in dietary intake and partly due to utilisation of antenatal care.

This study was organized and conducted by the Nutrition Foundation of India in collaboration with several scientists belonging to leading institutes. The Foundation acknowledges the support and contribution of all the scientists involved in this project.

Prema Ramachandran
Director, NFI

MAP OF INDIA SHOWING 7 STATES OF NFI STUDY

INTRODUCTION

Nutritional anaemia due to iron and folate deficiency is a major global Public Health problem. South Asia ranks among the regions, which have the highest prevalence of anaemia in the world and India perhaps has the highest prevalence of anaemia among the South Asian countries. The very high prevalence of anaemia in South Asia, to a large extent is due to predominantly vegetarian diet with high phytate and low iron content. Prevalence of anaemia in children, men, women and pregnant women in developed, developing countries and in urban and rural parts of India is given in Tables 1 and 2.

Table 1: Prevalence of Anaemia

	Global	Developed	Developing	India	
				Urban	Rural
Children < 5 years	43	12	51	60	70
Children > 5 years	37	7	46	50	60
Men	18	3	26	35	45
Women	35	11	47	50	60
Pregnant Women	59	14	51	65	75

Source: De Mayer E M Tegman A (1998) Prevalence of Anaemia in the World, World Health Statistics Quarterly , 38:302-316

Low dietary intake and poor iron and folic acid intake are major factors responsible for high prevalence of anaemia in India. Poor bioavailability of iron in phytate fibre rich Indian diet aggravates the situation. Anaemia due to deficiency of other micronutrients like copper, zinc, pyridoxine and vitamin B_{12} are rare in India. Hospital and community based studies conducted by Indian Council of Medical Research (ICMR) and other research agencies have shown that prevalence of anemia is highest in pregnant women–estimated prevalence range between 50 – 90%. Association between anaemia and adverse pregnancy outcome including increase in maternal morbidity and mortality, higher incidence of pre-term and low birth weight deliveries and associated high neonatal morbidity and mortality have been demonstrated when maternal haemoglobin level falls below 8.0g/dl. Available information on prevalence of anaemia in pregnancy in some of the neighboring countries and the estimates of cumulative deaths that might be averted by elimination of anaemia through appropriate management is indicated in Tables 3 and 4. It is obvious, that both in terms of deaths and Disability Adjusted Life Years (DALY), anaemia takes a very heavy toll in South East Asia.

Table 2: Prevalence of Anaemia

Country	Men	Women	Pregnant women	<5 yrs.	>5 yrs.
Africa	20	49	63	56	49
North America	4	8		8	13
Latin America	13	17	30	26	26
East Asia	11	18	20	20	22
South Asia	32	58	65	56	50
Europe	2	12	14	14	5
Oceania	7	19	25	18	15

Source: De Mayer E M Tegman A (1998) Prevalence of Anaemia in the World
World Health Statistics Quarterly , 38:302-316

The National Family Health Survey (NFHS-2) was the first National survey to undertake measurement of haemoglobin levels of all ever-married women in the age group 15-49 years and their children under three years of age in a representative sample of the

population using the same technique for Hb estimation. Data from NFHS-2 showed that prevalence of anaemia among pregnant women was 49.7%; reported prevalence being substantially lower than earlier reports from smaller community surveys. There was an uncertainty whether this lower prevalence was due to the improvement in haemoglobin levels following improved antenatal coverage or difference in the method used for estimation of Haemoglobin.

Table 3: Prevalence of anaemia in Pregnant / Lactating women in some Asian countries

Grps	B'Desh	Bhutan	India	Nepal	S.Lanka	Maldvs	Thailand	Malaysia	China
Preg	77	59	85	~75	39	68	16	58	35
Lact	77		77-95				15		

Source: Proceedings IX ACN. The burden of iron deficiency and anaemia in Asia : Challenges in prevention and control. Rudolfo F Florentino. Pp 313

Table 4: Estimates of lives saved if iron deficiency anaemia were eliminated by 2010 in 4 countries

Country	Maternal Mortality Ratio[1]	Perinatal Mortality[2]	Pregnancy Anaemia Prevalence (%)	Cumul. Lives Saved from 2003 to 2010[3]	
				Maternal Deaths Averted	Perinatal Deaths Averted
Malawi	1100	46	88	9,160	52,139
Mozambique	1100	90	37	4,775	56,309
Indonesia	380	40	74	18,209	268,866
India	540	85	88	80,630	3,903,540

[1]Per 1,00,000 live births[2] Per 1,000 live births[3] Assumes a linear decline in anaemia from the current prevalence to 50% of that level. Source:Ezzati M et al & Stoltzfus R J et al.

Data from NFHS-2 indicated that there was substantial interstate difference, especially the neighboring states, in the prevalence of anaemia. In Kerala, the prevalence of anaemia was substantially lower as compared to adjoining Tamil Nadu; Himachal Pradesh had markedly lower prevalence of anaemia as compared to neighboring Haryana. It is, therefore, essential to assess the factors responsible for the interstate differences and see if the performance of the states with lower prevalence of anaemia could be replicated in the other states so that there will be rapid reduction in anaemia and its adverse health consequences.

Department of Family Welfare funded NFI to carry out a research study in seven states (Tamil Nadu, Kerala, Himachal Pradesh, Haryana, Assam, Orissa and Madhya Pradesh)

- To estimate haemoglobin levels (Hb), using classical cyanmethaemoglobin method, in reproductive age women, and compare them with Hb values reported in the NFHS-2 survey,

- To obtain data on dietary intakes and food consumption patterns in the selected households and individuals,
- To assess access to and utilization of health services including receipt and consumption of iron-folic acid tablets,
- To assess the implementation of the Nutrition Programmes in selected areas,
- To assess the occurrence and severity of parasitic infestations and other major infections in the selected villages,
- To identify the possible factors underlying the interstate differences with reference to the prevalence of anaemia.

METHODOLOGY FOR THE STUDY

The study was taken up by NFI as a Task Force study in seven states. The composition of the Task Force and the responsibilities taken up by different consultants and the Staff of NFI are indicated in the Annexure. Each participating center appointed two-three field investigators (graduates or post graduates - nutrition/allied sciences) for data collection. In order to ensure uniformity, a pre-tested proforma was used for data collection in all centers. Prior to initiation of the study, all the field investigators were given an orientation training at NIN Hyderabad between 25-29th June 2001. The training programme included methodology to be used for

- Enumeration of households in the villages;
- Use of random number tables to select the study women;
- Dietary survey (by 24 hr dietary recall);
- Recording obstetric history, utilisation of health services, education related to health and nutrition etc;
- Training for anthropometric assessment.

The following supplies were centrally procured, checked and standardized at NIN, Hyderabad and given to all the centers participating in the study:
i) Anthropometeric rod, ii) Drabkin's solution, iii) Haemoglobin standard, iv) Deonised water, (items ii, iii and iv from Dr Reddy's lab) v) Whatmann filter paper, vi) Haemoglobin pipettes vii) Standardized utensil sets for 24 hr recall dietary survey. Weighing scales and colorimeters were procured locally according to the specifications provided by NIN. Dr Madhavan Nair, Asst. Director, NIN trained the field workers in Hb estimation and looked after external quality control; all the centers sent every 10th sample to NIN for Hb estimation.

The survey was undertaken as a Task Force study in seven states – Tamil Nadu and Kerala in the South; Himachal Pradesh and Haryana in the North; Assam and Orissa in the East and Madhya Pradesh in Central India. The study was coordinated by NFI. Seven collaborating institutions with investigators who had experience and expertise in conducting community based health and nutrition surveys were chosen to undertake the study. The centres in different states are indicated in Table – 5. The data were received, scrutinized and analyzed at NFI.

Table – 5 Participating centers in the 7 states

1. College of Home Science, Assam Agricultural University, Jorhat, Assam
2. Haryana Agricultural University, Hissar, Haryana
3. Himachal Pradesh Krishi Vishvavidyalaya,Palampur, Himachal Pradesh
4. Medical College, Trivandrum, Kerala
5. RIGHTS Consultants, Gwalior Madhya Pradesh
6. Orissa Institute of Medical Research and Health, Orissa
7.Avinashilingam Univ. for Home Sc. & Higher Education, Coimbatore, Tamil Nadu

STUDY DESIGN

The study design and the sampling frame were decided after detailed discussion in the Task Force meeting in which all the investigators participated. Initially, the study design envisaged that the survey would be conducted in a sub-sample of households and villages from the NFHS-2 survey sample. A total of 20 villages were to be selected from the different tertiles, the number of villages from each tertile being proportional to the tertile/size. From each of the 20 villages, a simple random sample of 15 households was to be selected, using circular systematic sampling, making a total of 300 households in each state. In case, the selected village did not have 15 women, the neighbouring village was to be taken.

However, the co-ordinators felt if 15 women belonging to different age and physiological status were investigated, it might be difficult to get adequate number in comparable subgroups for interstate comparison. It was, therefore, decided that only women from the most vulnerable groups - that is, pregnant and lactating women (upto 3 months) in the selected villages will be taken up in the study. All households with pregnant and lactating women were to be identified during household survey. It was decided that if there are more than 15 pregnant and lactating women in any village, the first 15 will be taken up for the survey and if there are less than 15, then efforts will be made to go to the adjoining village to recruit pregnant and lactating women so that a total of 15 women belonging to the two study groups are recruited.

RESULTS

The total number of women investigated in the two groups (Pregnant/lactating-< 3 months) in the seven states is indicated in Table 6.

There were substantial differences in the proportion of pregnant and lactating (<3 months) women recruited between the NFI survey states. This might be because of different approaches used by different investigators to recruit women belonging to these two groups.

Perhaps because of the large village size, Kerala was able to recruit 300 subjects inspite of low birth rate. States like Orissa, Haryana and Tamil Nadu also were able to collect data on 300 subjects. In Himachal Pradesh, because of relatively small village

Table - 6 Recruitment for the survey			
State	**Districts**	**Villages**	**Women surveyed (Preg + Lact)**
Assam	13	20	(132+93) 225
Haryana	9	20	(188+112) 300
Himachal Pradesh	9	30	(94+76) 170
Kerala	8	14	(244+56) 300
Madhya Pradesh	16	24	(125+44) 169
Orissa	7	23	(164+134) 298
Tamilnadu	13	20	(201+88) 289
Total			(1148+603) 1751

size and low birth rate there were a lot of difficulties in recruiting the required number of pregnant and lactating women. Even though 30 villages were surveyed, the total number of pregnant and lactating women who could be recruited for the survey was only 170.

NFHS-2 also faced similar problems and has relatively lower sample size in Himachal Pradesh. Further efforts to increase the number of villages beyond 30 was not attempted by NFI as this would have introduced a new bias as a large number of villages would have been not the same as covered by the NFHS-2 survey. In Assam also, the number of women recruited for the study was lower. In view of the problems of floods and local unrest, it was felt that the total number of women recruited in 20 villages where NFHS-2 was carried out would be utilized and no further efforts will be made to conduct the survey and recruit women from adjoining villages.

In Madhya Pradesh, there were no problems in recruiting sufficient numbers of women. However, the external quality control carried out by NIN indicated that there were large variations in reported haemoglobin levels (even though haemoglobin estimations were done under the supervision of Prof and Head Deptt of Biochemistry). So, only those samples in which haemoglobin estimations were done at NIN-Hyderabad were included in the study report (169 women).

Field investigators collected data on pretested uniform proforma. They did not have any problem in collecting socio-economic data, obstetric history, measuring height and weight and obtaining samples for haemoglobin estimation. However, they found it difficult to collect the data on occurrence and severity of parasitic infestations and other major infections in the selected villages. They were unable to get clinical examination done for detecting infections, samples collection, transportation and examination at the nearest laboratory with adequate quality control. In view of these difficulties, it was not possible to obtain data on infections including parasitic infections as a part of the survey.

Prevalence of Anaemia

Prevalence of anaemia in pregnant and lactating women is shown in Table 7 (a & b). Comparison of the data from NFI survey on prevalence of anaemia with NFHS data shows that the prevalence of anaemia in all states is higher in the NFI survey. Prevalence of anaemia in pregnant women from NFI survey is comparable to the data reported by the District Level Household Survey (DLHS) in all states. The NFI and DLHS had used the standard cyanmethaemoglobin method for estimating haemoglobin while NFHS had used the hemocue method.

Table 7 (a) Prevalence of anaemia (any anaemia) in pregnant women			
State	**Percentage of pregnant women with any anaemia**		
	NFI	**NFHS-2**	**DLHS 2002**
Assam	93.9 (132)	62.3 (217)	97.1 (131)
Haryana	68.1(188)	55.5 (174)	98.0 (343)
Himachal Pradesh	68.1(94)	31.8 (1766)	98.9 (166)
Kerala	59.0 (244)	20.3 (140)	35.0 (180)
Madhya Pradesh	96.8 (125)	53.8 (533)	94.6 (560)
Orissa	97.0 (164)	60.5 (297)	94.6 (532)
Tamilnadu	91.5 (201)	57.1 (310)	87.8 (353)
The figures in parenthesis indicates the sample size			

Table 7 (b) Prevalence of anaemia in lactating women		
State	**Percentage of lactating women with any anaemia**	
	NFI	**NFHS-2**
Assam	93.5 (93)	70.9 (685)
Haryana	88.4 (112)	56.1 (649)
Himachal Pradesh	65.8 (76)	47.6 (524)
Kerala	31.8 (56)	21.3 (455)
Madhya Pradesh	93.2 (44)	58.0 (1806)
Orissa	93.3 (134)	64.8 (1098)
Tamilnadu	76.1 (88)	61.1 (607)
The figures in parenthesis indicates the sample size		

Prevalence of anaemia was lower in Kerala as compared to Tamil Nadu and Himachal pradesh as compared to Haryana in both the NFI and NFHS-2 surveys. Madhya Pradesh, Orissa and Assam had higher prevalence of anaemia as compared to these states. There have been several recent publications indicating that hemocue overestimates Hb levels by 1.5 to 2.0 g/dl but there is no correlation between haemoglobin values from cyanmethaemoglobin method and hemocue method. It would appear that hemocue method is responsible for the lower prevalence of anaemia reported in NFHS-2.

INTERSTATE DIFFERENCES

Kerala and Tamil Nadu

A detailed comparative profile of demographic and socio-economic characteristics of the households in the states of Kerala and Tamil Nadu in both the NFI and NFHS II surveys is presented in Annexure 1.

The data shows that in Kerala only 50% of the subjects were Hindus as compared 95% in Tamil Nadu. The Kerala women had higher literacy, better housing, better access to mass media and health care as compared to women in the neighboring state of Tamil Nadu. In Tamil Nadu, more than 90% women were anaemic in both the groups whereas in Kerala, only 58% pregnant and 60% lactating women are anaemic.

Some of the factors, which may account for atleast in part for higher prevalence of anaemia in Tamil Nadu are mentioned in Table 8:

- Earlier age at marriage and of pregnancy;
- Lower literacy
- Lower dietary intake, especially minerals and micronutrient rich food stuffs;
- Low percentage of women receiving IFA tablets, still lower number getting for $\geq$90 days and 71% of them consuming regularly as against 97% in Kerala;

- Higher prevalence of underrnutrition (more number of the subjects with height below 145 cm and BMI less than 18.5Kg/m^2);
- Lower percentage receiving ANC, especially from a doctor and the first ANC being done in the first trimester;
- Less percentage of women with anaemia awareness;
- Lower intake of calcium, iron and vitamin C rich foods in the diet and low percentage of women taking these nutrients ≥70% RDA.

Table 8 Factors responsible for the anaemia prevalence difference between the states of Kerala and Tamil Nadu

	Kerala	Tamil Nadu
Age <20 (yrs)	7.7	15.6
Education of women (upto 10th class or above)	95.3	58.9
Education of Husband (upto 10th class or above)	95.7	67.5
Aware about anaemia	74.3	15.9
Anaemia could be prevented by diet	91.0	69.7
Receiving IFA Tab.	91.0	66.8
Received supply for 3+ months	55.8	43.5
Regular consumed IFA tab.	96.7	71.4
SLI (low)	23.3	18.3
SLI (High)	21.3	19.0
Birth order > 3	1.7	2.0
Ht. <145.0 cm	7.3	12.1
BMI <18.5 (kg/m^2)	11.0	19.7
Antenatal checkup by doctor	71.0	50.2
First antenatal check-up (Ist trimester)	81.3	61.9
Mean Height (cm)	154.2±5.9	151.4±5.8
Mean weight (kg)	53.2±8.8	46.4±6.6
BMI (kg/ht^2)	22.4±3.3	20.2±2.5
Nutrients		
Energy (Kcal)	1850±526	2012±514
Calcium (mg)	664±422	359±291
Iron (mg)	17.1±11.0	11.3±6.7
Vit C (mg)	74±68	38±35
Free Folic Acid (ug)	64.3±45.3	105.4±58.3
Nutrients (≥70% RDA)		
Energy	72.0	83.7
Calcium	38.7	12.1
Iron	16.3	6.2
Vitamin C	72.0	40.5
Free Folic Acid	3.3	14.2

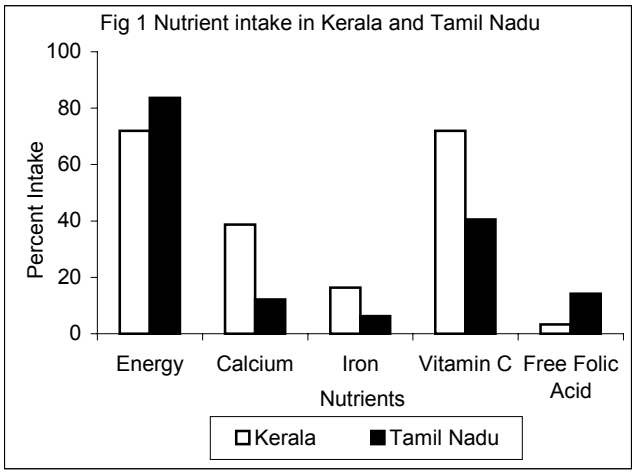


Figure 1 shows the difference in the dietary intake (expressed as ≥70% RDA) of the subjects between the two states. Though the energy intake was higher in Tamil Nadu, but the intake of calcium, iron and vitamin C was higher in the state of Kerala.

Himachal Pradesh and Haryana

A comprehensive profile of demographic and socio-economic characteristics of the households in the states of Himachal Pradesh and Haryana in both the NFI and NFHS II surveys is presented in Annexure 2.

The household profile data of this state shows that though higher percentage of women are illiterate as compared to the adjoining state of Himachal Pradesh but more number of women have education upto high school in the former. Also, higher proportion of households has pucca houses. In Himachal Pradesh, more number of subjects had access to piped water, electricity and better sanitation facilities.

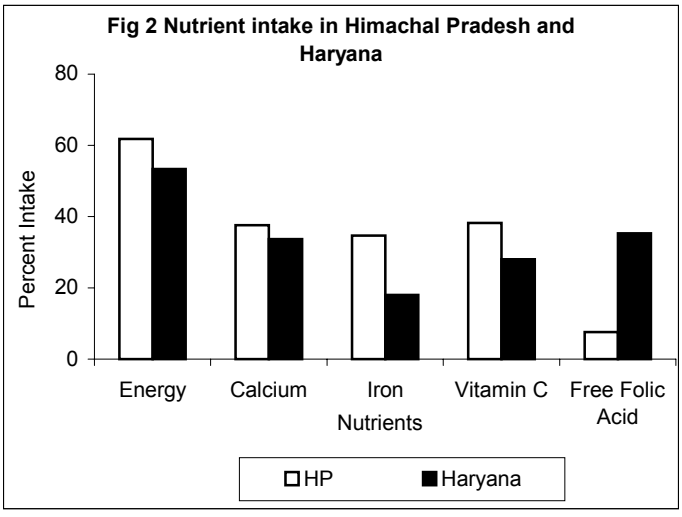
Both the NFHS-2 and NFI surveys showed a substantial difference in the prevalence of anaemia both among the pregnant and lactating (<3 months) between Himachal

Pradesh and Haryana. In Haryana, more than 90% women were anemic in both the groups whereas in Himachal Pradesh, 68% pregnant and 91.0% lactating women are anemic.

The important factors possible for higher prevalence of anaemia in Haryana are presented in Table 9.

Table 9 Factors responsible for the anaemia prevalence difference between the states of Himachal Pradesh and Haryana

	Himachal Pradesh	Haryana
Age <20 (yrs)	5.3	12.3
Education of women (upto 10th class or above)	66.4	67.0
Education of Husband (upto 10th class or above)	83.5	79.1
Aware about anaemia	29.4	49.0
Aware that anaemia could be prevented by diet	98.0	63.3
Receiving IFA Tab.	95.3	68.0
Received supply for 3+ mths	86.4	26.5
Regular consumed IFA tab.	85.7	74.1
SLI (low)	15.3	22.0
SLI (High)	12.9	24.7
Birth order > 3	1.8	7.4
Ht. <145.0 cm	5.3	4.7
BMI <18.5 (kg/m^2)	54.1	19.0
Antenatal check-up by doctor	94.1	12.0
First ANC (Ist trimester)	82.9	31.7
Mean Height (cm)	159.8±9.2	153.2±4.4
Mean weight (kg)	46.4±5.6	49.5±7.3
BMI (kg/m^2)	18.2±2.2	21.0±2.8
Nutrients		
Energy (kcal)	1949±859	1710±587
Calcium (mg)	779±617	626±316
Iron (mg)	28.1±27.1	17.8±6.7
Vit C (mg)	57±83	28±26
Free Folic Acid (ug)	71.1±57.1	158.2±77.6
Nutrients (≥70% RDA)		
Energy	61.8	53.3
Calcium	37.6	33.7
Vitamin C	38.2	28.0
Iron	34.7	18.0
Free Folic Acid	7.6	35.3



- Earlier age at marriage and of pregnancy;
- Lower literacy;
- Low dietary intake of mineral and micronutrient rich food stuffs in Haryana;,
- Low percentage of women receiving IFA tablets, still lower number getting for ≥90 days and 74% of them consuming regularly as against 86% in Kerala.
- More number of subjects with birth order more than 3, higher fertility rate and more fetal loss.
- The percentage of women who got ANCs done in the first trimester and those who got it done by a doctor was much higher than in Haryana.

- Lesser intake of energy, calcium, iron and vitamin C rich foods in the diet and low percentage of women taking these nutrients ≥70% RDA. Women in Himachal Pradesh were consuming more GLVs and vegetables, citrus fruits, milk, fish and meat. In Haryana, the diet consumption is based on wheat, pulses, rice and milk products.

Figure 2 shows that the data from the diet survey of these two states shows that the women from Hiamchal Pradesh had higher intake of energy, calcium, iron and vitamin C intake than the women from Haryana

Assam, Orissa and Madhya Pradesh

The demographic and socio-economic profile of the households in the states of Assam, Madhya Pradesh and Orissa in both the NFI and NFHS II surveys is presented in Annexure 3.

The data shows that the literacy rates were quite low in these three states with most of the women being housewives. These states had higher percentage of subjects with nuclear families and majority of them lived in either kutcha or semi pucca houses. A lower percentage of the subjects had access to piped water, better proper sanitation facilities, electricity (in Assam and Orissa) and exposure to mass media.

Both the data sets, i.e), NFHS-2 and NFI, showed a high prevalence of anaemia in Assam, Orissa and Madhya Pradesh (Table 10).

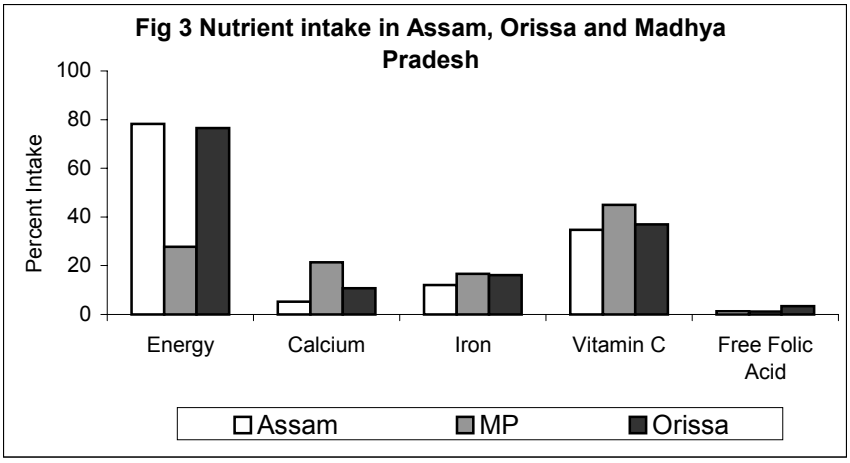
Table 10 Factors responsible for the anaemia prevalence difference among Assam, Orissa and Madhya Pradesh

	Assam	Orissa	Madhya Pradesh
Age <20 (yrs)	14.2	6.7	11.2
Education of women (upto 10th class or above)	38.3	43.6	24.3
Education of Husband (upto 10th class or above)	46.2	58.7	56.8
Aware about anaemia	4.0	30.9	9.5
Anaemia could be prevented by diet	3.6	28.5	8.3
Receiving IFA Tab.	32.0	58.4	74.6
Received supply for 3+ months	12.0	29.9	6.3
Regular consumed IFA tab.	4.9	63.5	6.3
SLI (low)	24.9	60.4	22.5
SLI (High)	29.3	6.4	26.6
Birth order > 3	15.1	9.7	7.7
Ht. <145.0 cm	14.7	17.4	13.6
BMI <18.5 (kg/m^2)	29.8	26.8	17.2
Antenatal check-up by doctor	24.4	73.5	0.6
First antenatal check-up (Ist trimester)	28.7	39.3	17.8
Mean Height (cm)	150.3 ±5.1	148.9 ±5.4	150.1 ±4.5
Mean weight (kg)	44.7 ±6.2	44.4 ±5.6	46.9 ±6.1
BMI (kg/h^2)	19.8 ±2.2	19.8 ±2.1	20.8±2.5
Nutrients			
Energy (kcal)	1934 ±447	2009 ±567	1404 ±427
Calcium (mg)	281 ±314	428 ±548	499 ±291
Iron (mg)	13.1 ±8.3	14.9 ±11.6	19.4 ±9.0
Vit C (mg)	37 ±35	40 ±39	49 ±56
Free Folic Acid (ug)	38.3 ±42.0	55.9 ±31.2	59.8 ±28.7
Nutrients (≥70% RDA)			
Energy	78.2	27.8	76.5
Calcium	5.3	21.3	10.7
Iron	12.0	16.6	16.1
Vitamin C	34.7	45.0	36.9
Free Folic Acid	1.3	1.2	3.4

As compared to the other four states, in these states:

- The literacy status is poor both for the subjects and their husbands in these 3 states.
- The number of women going for ANC was low.
- The percentage of subjects getting IFA tablets for more than 90 days was low (6-29%).
- Very few women got themselves registered in the first trimester of pregnancy. The subjects had lower marriage age and higher parity (more than 2.5).
- Age of marriage was low in Assam and Madhya Pradesh.
- The iron and vitamin C consumption of the subjects was lower than the RDA. FFA intakes were far lower than the RDA.

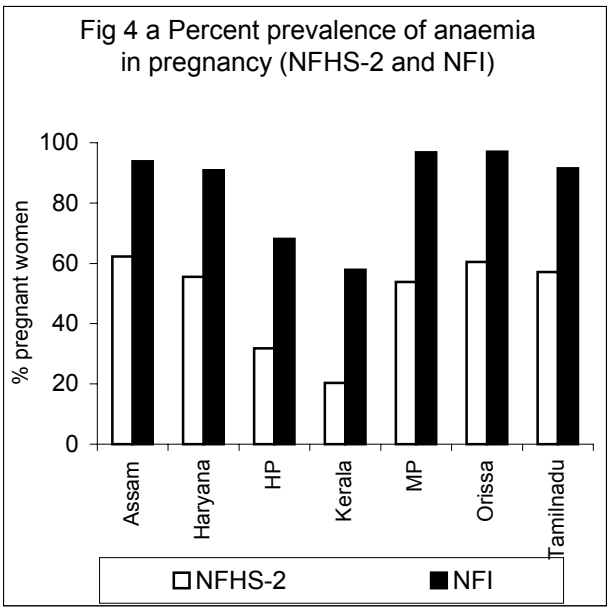
The energy intake in Assam, Orissa and Madhya Pradesh was higher than the other four states. Data from NNMB surveys show that energy intake in Madhya Pradesh was substantially higher than those reported in the NFI survey. This might atleast in part be due to the relative very small number of women in whom data was available in MP and the sample being non-representative. However, the intake of calcium, iron and vitamin C in these states was substantially lower.

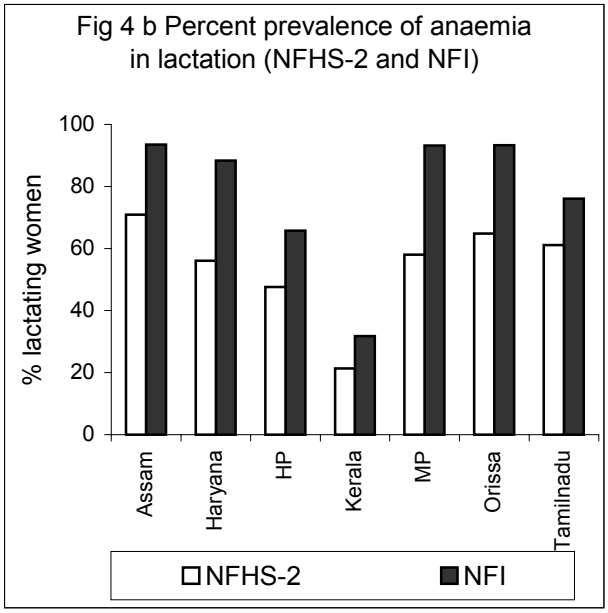


DISCUSSION

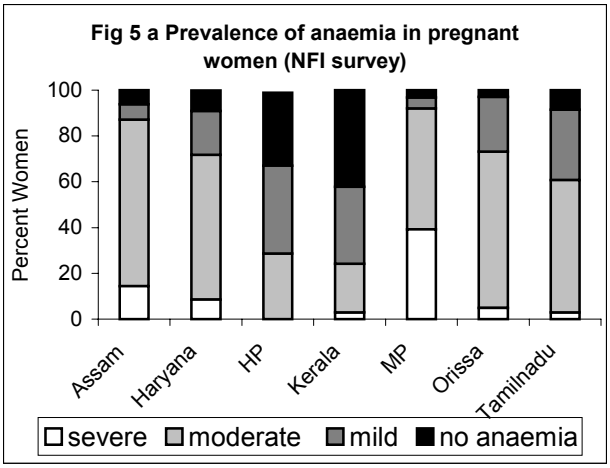
Prevalence of anaemia

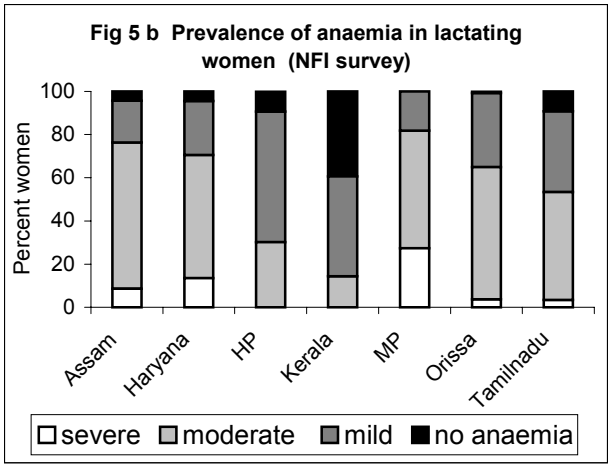
The data from the NFI survey clearly showed that the prevalence of anaemia is higher both in pregnant and lactating women as compared to the reported levels in NFHS-2 in every state. Inspite of the significantly higher haemoglobin level and lower prevalence of anaemia reported in the NFHS-2 survey, the pattern of interstate differences in prevalence of anaemia was similar in NFI and NFHS surveys; prevalence of anaemia was lowest in Kerala while Madhya Pradesh had the highest prevalence of anaemia (Figure 4 a & b).



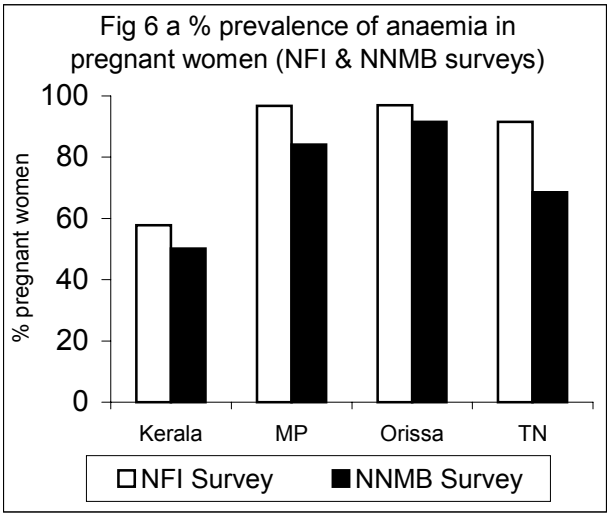


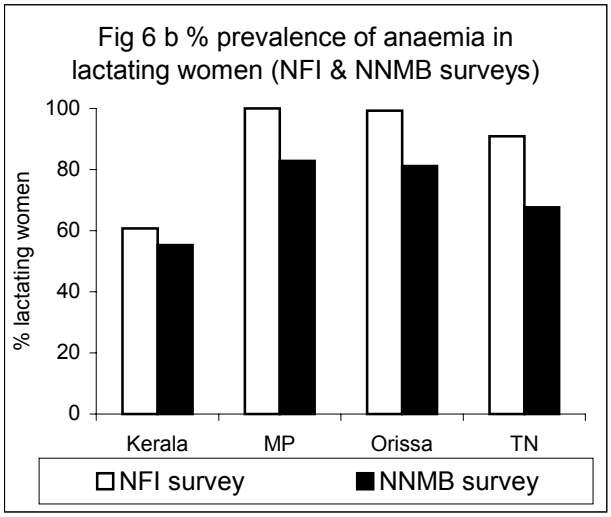
The percent prevalence of different grades of anaemia (normal/ mild/ moderate/ severe) in NFI survey is shown in Figures 5 a & b. There was not a single case of severe anaemia in Himachal Pradesh among the pregnant women; none of the lactating women in Kerala and Himachal Pradesh had severe anaemia. Among the seven states prevalence of severe anaemia was highest in Madhya Pradesh (Figures 5 a & b). Comparative data on the prevalence of anaemia from NFI survey and the National Nutrition Micronutrient Survey (NNMB) micronutrient survey (2003) in four states is shown in Figure 6 a & b. Prevalence of anaemia both in pregnant and lactating women in NFI and NNMB surveys were higher than that reported in NFHS-2.





Comparative data on prevalence of anaemia in pregnant women in seven states from NFI and DLHS phase I (2002) survey of Ministry of Health and Family Welfare are shown in Figure 7. Both DLHS and NFI survey reported higher prevalence of anaemia than NFHS–2. In all these surveys except NFHS, cyanmethaemoglobin method was used for the estimation of haemoglobin. During the last there has been several publications indicating that Haemocue method used for estimation of Hb in NFHS over





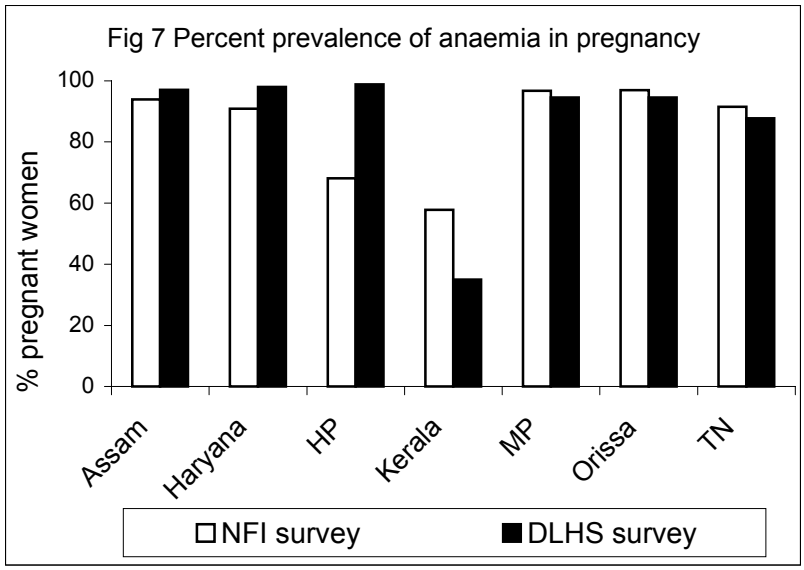
estimates Hb levels by 1 to 1.5 g/dl. This is responsible for the higher Hb levels and lower prevalence of anaemia reported in NFHS–2. NFI, DLHS, NNMB and ICMR micronutrient surveys have clearly shown that the filter paper collection of samples and

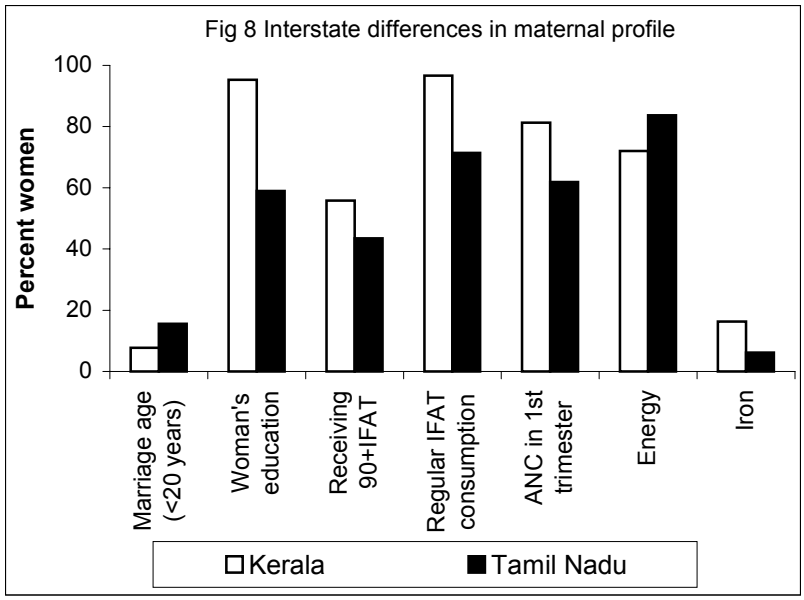
Hb estimation by Cyanmethhaemoglobin method represents the most economical and accurate methods of estimation of Hb in community based surveys.

All these surveys (except NFHS-2) have used cyanmethaemoglobin method for the estimation of haemoglobin and have shown that the prevalence of anaemia in all states is far higher than the levels reported by the NFHS-2 survey. These data clearly show that the prevalence of anaemia among the pregnant and lactating women in India is still very high and needs immediate attention to combat it.

Interstate differences in prevalence of anaemia

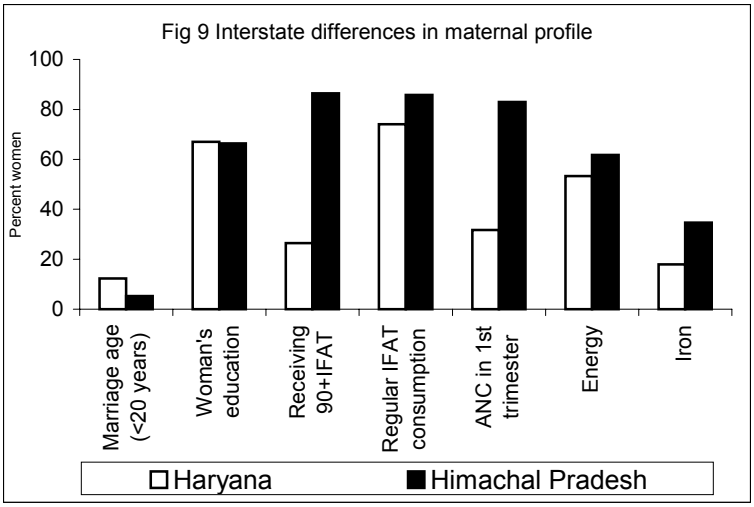
Both NFI and NFHS surveys have shown that prevalence of anaemia was higher in Tamil Nadu as compared to the neighbouring state of Kerala. In Tamil Nadu, more than 90% women were anaemic in both the groups (pregnant and lactating – upto 3 months) whereas in Kerala, only 58% pregnant and 60% lactating women were anaemic. Differences in profile of women in these two states, which might in part be responsible for the lower prevalence of anaemia in Kerala, are indicated in Figure 8. Later age at marriage, higher womens' education, higher iron intake, better ante-natal care, higher percentage of women consuming Iron-folic acid tablets regularly are some of the significant differences in the profile of pregnant women which might account for lower prevalence of anaemia in Kerala.



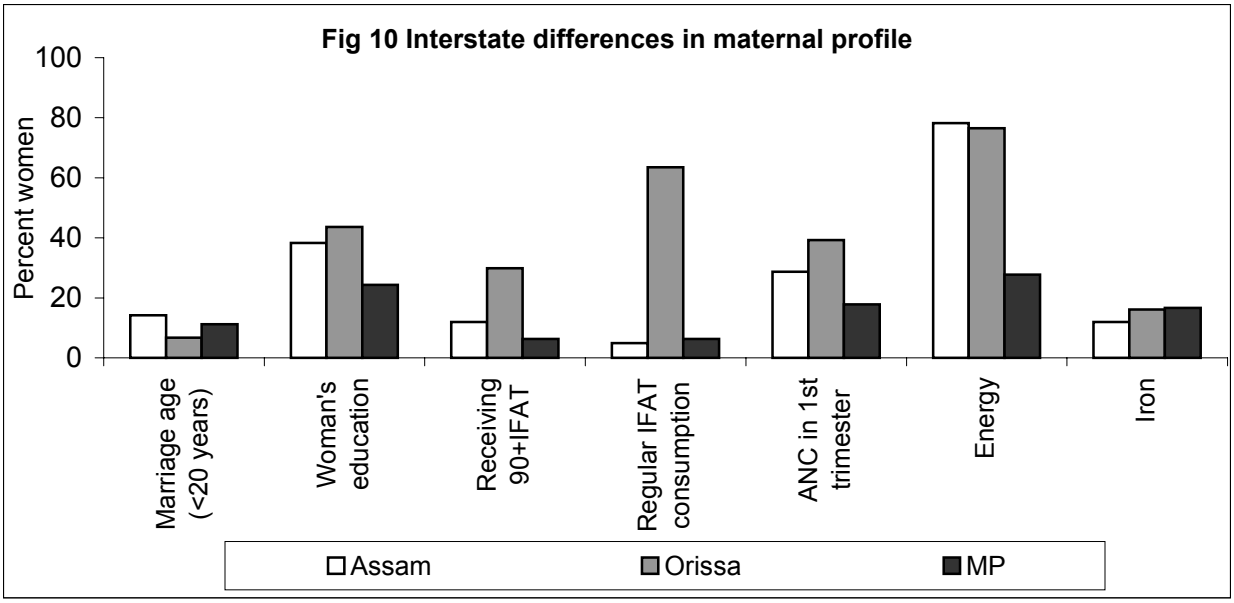


Prevalence anaemia in Haryana was higher than prevalence in Himachal Pradesh both in NFI and NFHS-2 surveys (in Haryana, more than 90% women were anaemic in both the groups, in Himachal Pradesh 68% pregnant and 91.0% lactating women were anaemic). Later

age at marriage, better energy intake, substantially higher iron intake, better ante-natal care, regular access to intake of iron-folic acid tablets in Himachal Pradesh (Figure 9) are some of the factors that might account for the significantly lower prevalence of anaemia in this state.



Both NFHS and NFI surveys had shown that among the seven states prevalence of anaemia was higher in Assam, Orissa and Madhya Pradesh. All the three states had lower literacy rates, lower energy and iron intake, poorer access to antenatal care and low consumption of IFA tablets as compared to other states (Figure 10).

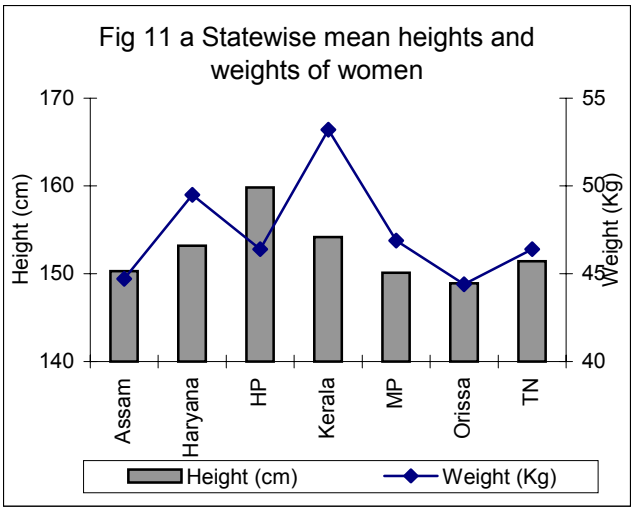


The NFI survey confirmed that there are interstate differences in the mean haemoglobin levels as well as the prevalence of different grades of anaemia between states. Three major factors, which were associated with the lower prevalence of anaemia, were:

- higher dietary intake including better dietary diversification ,
- better family formation patterns (including higher age at marriage, lesser number of births, higher interpregnancy intervals) and
- better utilization of health care especially antenatal care (higher coverage, better quality of antenatal care including haemoglobin estimation and increased consumption of iron and folate medication).

Factors affecting haemoglobin levels

The profile of NFI survey women is shown in figures 11-15. Majority of women in all states, irrespective of socioeconomic, demographic categories were anaemic. Both NFHS-2 and NFI surveys report higher prevalence of anaemia in scheduled caste and schedules tribes.



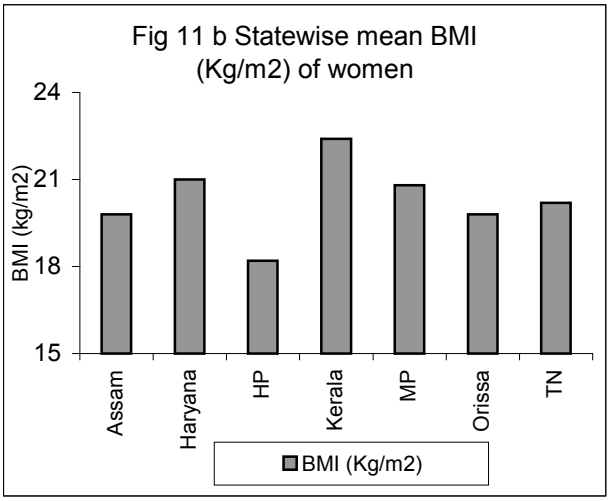
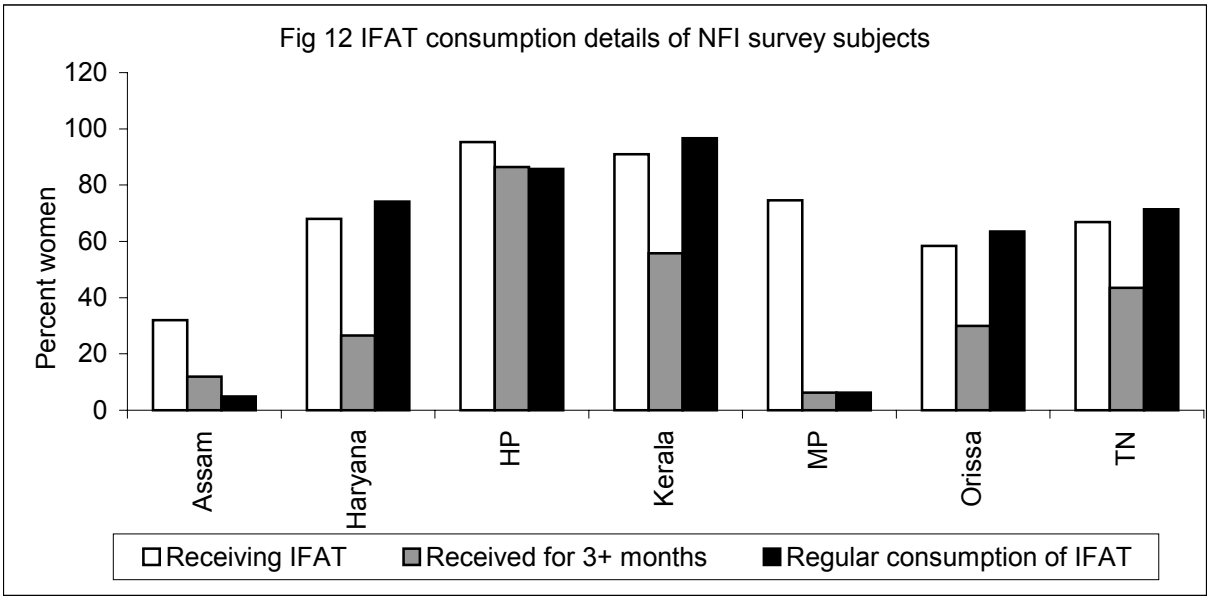
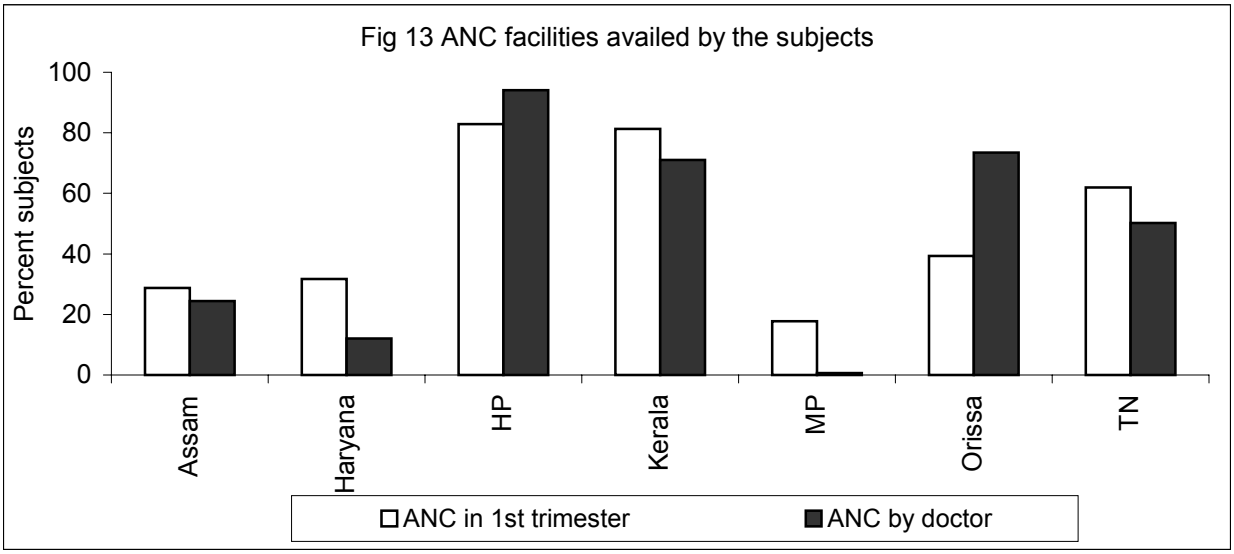


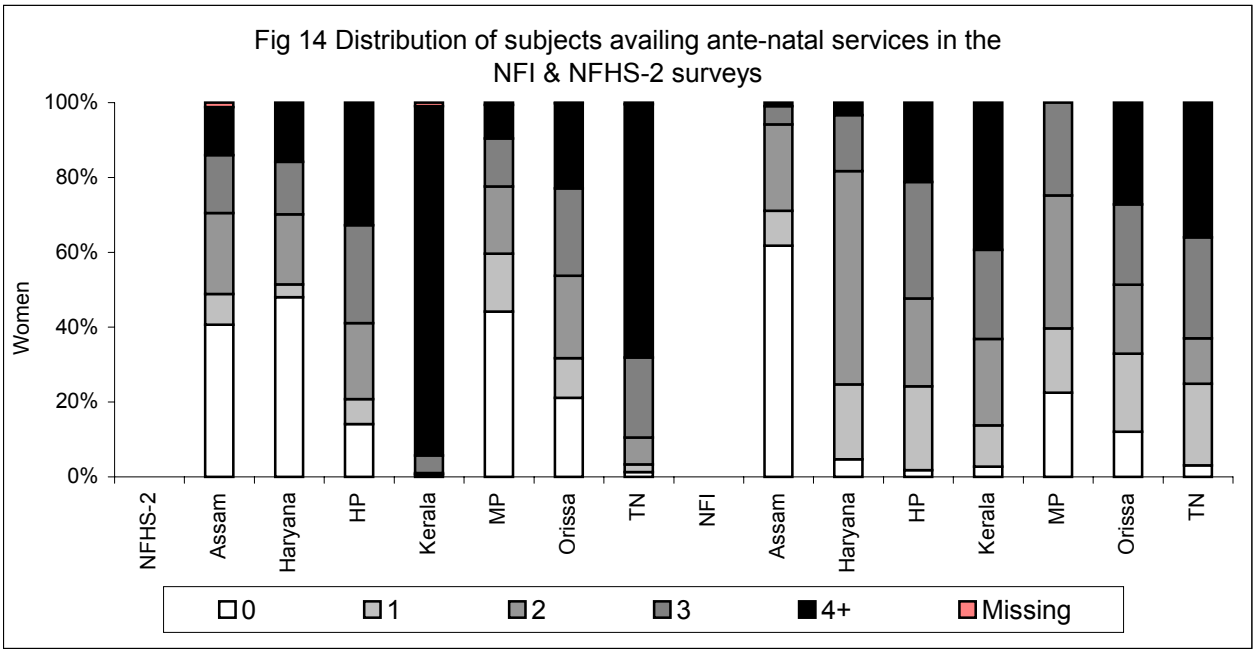
Figure 12 indicates the percent of women who received IFA (at anytime); IFA supply for more than 3 months and also percent of women and also percent of women who received IFA supply for more than 3 months and consumed them regularly. Prevalence of anaemia was lower among educated women and women from higher income families. The prevalence of anaemia was least in the states of Kerala and Himachal Pradesh. In both the states more women got ANC and received IFA tablets and consumed them regularly (Figure 12).



The corresponding percentage for each of these was lower in Madhya Pradesh, Orissa and Assam. The antenatal facilities were availed by less number of the subjects in the



states of Assam, Haryana, Madhya Pradesh and Orissa. Hardly any woman got the ANC done by the doctor in Madhya Pradesh where as 94% in Himachal Pradesh and 71% in Kerala got their ANC done by a doctor. The data shows that the prevalence of anaemia was less in states where the women got their ANC done in the first trimester and had consulted doctors (Figure 13). The number of times the subjects in the NFI/NFHS-2 surveys who availed the ANC services is shown in figure 14. The



percentage of women who did not avail the ANC services at all is much less in the NFI survey as compared to the NFHS-2 survey except in the state of Assam where the number of women with not even a single ANC was quite high (in the NFI survey).

The data from NFI dietary survey (by 24 hr dietary recall method) showed that dietary intake of majority of the subjects in all the seven states were much less than the recommended dietary allowances (Table 11). However, there was substantial difference in the dietary intakes of the subjects in different states. The energy and other nutrient intake, as observed, in the seven states is shown in figure 15 (a & b).

Table 11 The Recommended Dietary Allowance (RDA) of women in different physiological states

RDA	NPNL* sedentary workers	NPNL* Moderate workers	Pregnant sedentary workers	Lactating Sedentary workers
Energy (Kcal)	1875	2225	2175	2425
Calcium (mg)	400	400	1000	1000
Iron (mg)	30	30	38	30
Vit. A (ug)	600	600	600	650
Vit C (mg)	40	40	40	80
Free Folic Acid (ug)	100	100	400	250

**non-pregnant, non-lactating*

It is noteworthy that even though the energy intake is lower in Himachal Pradesh, as compared to Assam, Orissa and Tamil Nadu, their iron and vitamin C intake is significantly higher than most of the other states (Fig.15). This may atleast in part be responsible for lower prevalence of anaemia among the subjects in Himachal Pradesh.

Fig 15 a Mean energy intake by NFI survey subjects

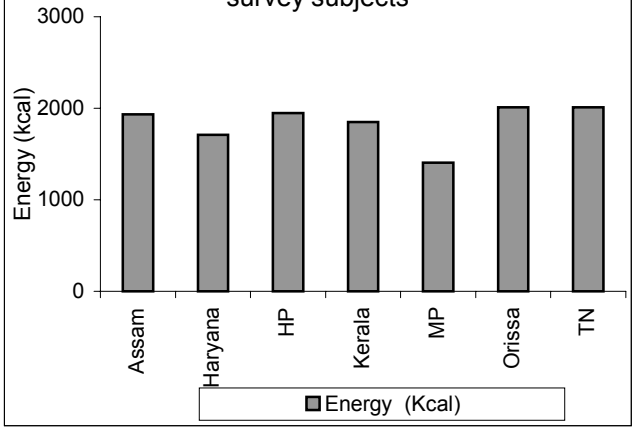
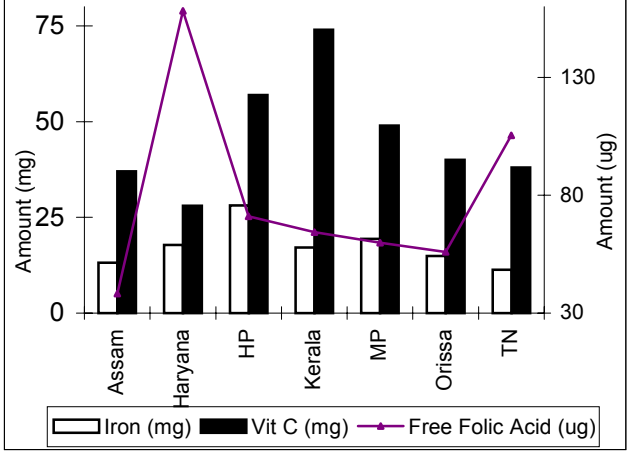


Fig 15 b Mean iron, vit C and FFA intake



Nutritional anaemia in pregnancy: likely causative factors

Low dietary intake of macro and micronutrients, especially iron and folate and poor bioavailability of iron from Indian diets is responsible for very high prevalence of anaemia in the country. In the present study detailed analysis demonstrated that the following factors are related to haemoglobin level in pregnancy:

- Literacy, occupation and living standard of women;
- Age at marriage, number of pregnancies, gestational age, adequate dietary intake of energy, iron and free folic acid;
- ANC : Begun in first trimester, having more than 5 ANCs during pregnancy, ANC given by doctors, regular consumption of IFA tablets (>90 tablets).

Profile of the women in the seven states has shown that there were substantial differences in the dietary intakes and nutritional status of women between the states. The present survey confirmed that there are interstate differences in the mean haemoglobin levels as well as the prevalence of different grades of anaemia between states. Three major factors, which were associated with the lower prevalence of anaemia, were:

- higher dietary intake including better dietary diversification,
- better family formation patterns (including higher age at marriage, lesser number of births, higher interpregnancy intervals) and
- better utilization of health care especially antenatal care (higher coverage, better quality of antenatal care including haemoglobin estimation and increased consumption of iron and folate medication).

RECOMMENDATIONS

Preferred method for Haemoglobin estimation in community based surveys

Data from NFI survey as well as ICMR micronutrient survey, NNMB survey and DLHS survey clearly indicate that prevalence of anaemia in pregnancy and lactation are very high. All these surveys clearly show that filter paper sample collection and Hb estimation by cyanmethaemoglobin method is feasible in large-scale community based surveys. This method is economical and gives accurate results and hence is the method of choice in estimation of haemoglobin in community-based surveys.

Strategy for prevention of anaemia

Data from NFI, NNMB, DLHS and ICMR Micronutrient survey clearly indicate that anaemia is a major public health problem affecting all segments of the population in all age and physiological groups. As majority of India's one billion plus population is anaemic it is imperative that every effort is made to increase the iron and folate intake of the population and reduce the prevalence of anaemia through:

- improvement in dietary intake to meet RDA for all macro and micronutrients;
- dietary diversification inclusion of iron folate rich foods as well as food items that promote iron absorption;
- health and nutrition education to improve over all dietary intakes and promote consumption of iron and folate-rich foodstuffs.

Research & Development (R&D) efforts to identify iron folate rich, acceptable, inexpensive green leafy vegetables in different agro climatic zones in the country, growing and processing them so that they could be made available through out the year at affordable cost is a priority item for intersectoral coordination.

Fortification of common salt has been advocated as the most economical feasible and sustainable method of doubling the iron intake of Indian population. Research and development efforts focused on evaluation of the safety, efficacy, acceptability and cost

effectiveness of double (iodine and iron) fortified salt should be taken up on priority basis so that appropriate technology/technologies for double fortification is made available before the end of Tenth Plan period. Once this is achieved, decisions regarding making it mandatory that all salt for human consumption is fortified with iron and iodine universal double fortification of salt and its supply if necessary at a subsidised cost through TPDS system to people below poverty line could be taken. These measures have to be initiated right now and sustained over the next few years so that there is a change in the attitude and practices, which will result in sustainable improvement in Hb levels of the entire population.

Screening for anaemia and appropriate management of anaemic persons

Current efforts to improve dietary diversification and adequate intake of iron and folic acid will result in improvement of Hb levels of the population over the next decade. In the meantime, efforts to screen vulnerable population for anaemia and appropriate management of anaemic individuals have to be continued so that the adverse health consequences of anaemia are minimized. As anaemia is a major problem even in childhood and adolescence, every effort should be made to screen under nourished children and adolescent girls for anaemia. Anaemia is a major cause of maternal and perinatal morbidity and mortality. So every effort should be made to ensure universal screening for anaemia as a part of antenatal care. Anaemic children and adolescents should receive oral iron and folate treatment.

Anaemia antedates pregnancy, gets aggravated during pregnancy and gets perpetuated in women who go through rapid succession of pregnancies. Nearly three decades after initiation of the National Programme for prevention and control of anaemia, analysis of data from the present survey as well as the NFHS, ICMR, NNMB and DLHS show that the majority of pregnant women are anaemic; they are not screened for anaemia and iron and folic acid tablet intake is low. As part of antenatal care, universal screening of all pregnant women at least once in early pregnancy, is an essential prerequisite for detection and management of anaemia in pregnancy. Management of anaemia in pregnancy depends upon the severity and the time available for correction of anaemia. The strategy for treatment of anaemia in pregnancy proposed during the Tenth Plan consisting of

- oral iron folate prophylactic therapy for all non-anemic pregnant women (haemoglobin more than 11 g/dl)

- iron folate oral medication at the maximum tolerable dose throughout pregnancy for women with haemoglobin level between 8 and 11 g/dl,

- parenteral iron therapy for women with haemoglobin level between 5 and 8 g/dl if they do not have any obstetric or systemic complication,

- hospital admission and intensive personalised care for women with haemoglobin less than 5 g/dl ,
-

- screening and effective management of obstetric and systemic problems in all anemic pregnant women, and

- improvement in health care delivery systems and health education to the community to promote utilisation of available care

should be fully operationalised as early as possible in order to successfully combat this public health problem expeditiously .

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Annexure 1

Household profile comparison of NFI & NFHS-2 (rural) surveys in Kerala & Tamilnadu state

	Kerala		Tamilnadu	
Profile of the women	**NFHS-2 Rural**	**NFI survey**	**NFHS-2 Rural**	**NFI study**
Age (yrs)				
15-19	3.5	7.7	6.0	15.6
20-24	13.4	40.3	17.1	52.6
25-29	19.4	35.0	20.1	20.8
30-34	17.9	12.3	17.1	9.3
35-39	17.9	3.7	15.1	1.7
40-44	15.1	0.7	13.3	0.0
45-49	13.0	0.3	11.3	0.0
Education of women				
Illiterate	13.9	1.3	57.9	28.7
Literate,< primary school	10.0	3.3	4.5	12.5
High school complete	62.4	66.3	33.8	49.5
Higher secondary complete & above	13.6	29.0	3.8	9.4
Religion				
Hindu	48.3	49.3	93.4	94.5
Muslim	36.1	37.7	3.0	1.4
Christian	15.5	13.0	3.6	4.2
Jain	0.0	0.0	0.0	0.0
Caste/tribe				
Scheduled caste	9.5	9.7	26.4	21.8
Scheduled tribe	1.2	1.7	1.2	1.0
Backward caste	41.4	62.3	72.0	76.8
Other	47.9	26.3	0.4	0.0
Work status of women				
Working in family farm/ business	2.6	0.0	14.1	0.0
Employed by someone else	17.7	3.0	45.0	4.9
Self-employed	5.1	2.7	3.5	3.4
Not worked in past 12 months (Housewife)	74.6	94.3	37.4	91.7
Husband's education				
Illiterate	8.8	0.0	35.4	22.1
Literate,< primary school	14.1	4.3	8.0	10.4
High school complete	64.3	75.0	49.3	54.0
Higher secondary complete & above	12.6	20.7	7.1	13.5
Missing	0.2	0.0	0.2	0.0
Type of family				
Nuclear	52.9	22.3	68.0	40.9
Joint	47.1	21.7	32.0	30.4
Extended nuclear	0.0	56.0	0.0	22.1

	Kerala		Tamilnadu	
Background characteristic	**NFHS-2 Rural**	**NFI survey**	**NFHS-2 Rural**	**NFI study**
Type of house				
Kutcha	7.8	10.7	42.8	34.6
Semi pucca	15.5	63.3	38.3	52.6
Pucca	76.7	26.0	18.8	12.8
Missing			**0.1**	**0.0**
Source of drinking water				
Piped	11.4	17.7	64.8	93.1
Hand pump	2.2	0.0	18.4	0.0
Well water	83.6	78.3	13.3	6.9
Surface water (tube well)	1.1	0.0	3.3	0.0
Other (stream/canal/river)	1.7	4.0	0.2	0.0
Sanitation facility				
Sanitary latrine	15.4	81.0	12.6	6.2
Pit toilet/Manually cleaned latrine	67.3	14.0	0.3	2.8
No facility	17.3	5.00	87.1	91.0
Electricity				
Yes	66.7	74.7	72.5	76.8
No	33.3	25.3	27.5	23.2
Main type of fuel used for cooking				
Wood	86.0	75.7	84.2	85.5
Kerosene	1.7	1.2	6.9	5.9
Liquid petroleum gas (LPG)	10.7	22.7	6.2	8.7
Others	1.6	0.0	2.7	0.0
Exposure to mass media				
Newspaper	61.2	28.0	15.8	2.1
Radio	69.9	66.0	49.2	31.1
Television	56.3	43.3	53.2	37.7
Standard of living index				
Low	21.6	23.3	51.0	18.3
Medium	54.4	53.3	40.3	62.6
High	24.1	21.3	7.7	19.0
Missing			1.0	0.0

Annexure 2

Household profile comparison of NFI & NFHS-2 (rural) surveys in Haryana & HP state

	Haryana		Himachal Pradesh	
Profile of the women	**NFHS-2 Rural**	**NFI survey**	**NFHS-2 Rural**	**NFI study**
Age (yrs)				
15-19	7.2	12.3	2.2	5.3
20-24	19.6	51.7	17.2	48.8
25-29	20.7	27.3	20.9	37.1
30-34	18.9	7.0	18.5	7.1
35-39	12.7	1.7	15.7	1.8
40-44	11.6	0.0	13.9	0.0
45-49	9.4	0.0	11.6	0.0
Education of women				
Illiterate	65.6	30.7	38.3	8.8
Literate,< primary school	2.5	2.3	4.5	24.7
High school complete	29.8	56.0	51.8	27.6
Higher secondary complete & above	2.2	11.0	5.4	38.8
Religion				
Hindu	88.9	99.3	93.8	100.0
Muslim	4.9	0.0	3.1	0.0
Christian	0.0	0.0	0.0	0.0
Jain	0.0	0.0	0.0	0.0
Others	6.2	0.7	1.1	0.0
Caste/tribe				
Scheduled caste	23.3	16.7	22.3	40.0
Scheduled tribe	0.1	4.0	0.5	13.5
Backward caste	25.4	13.0	49.6	10.0
Other	51.2	66.3	57.6	36.5
Work status of women				
Working in family farm/ business	4.4	9.6	12.8	19.4
Employed by someone else	6.5	7.4	7.1	18.2
Self-employed	0.6	1.7	0.3	0.6
Not worked in past 12 months (Housewife)	88.4	81.3	79.8	61.8
Husband's education				
Illiterate	31.3	19.3	16.4	2.4
Literate,< primary school	3.6	1.7	3.8	14.1
High school complete	53.5	53.7	66.3	31.8
Higher secondary complete & above	11.5	25.4	13.4	51.7
Type of family				
Nuclear	64.1	40.3	59.2	52.4
Joint	35.9	50.0	40.8	42.9
Extended nuclear	0.0	9.7	0.0	4.7

	Haryana		Himachal Pradesh	
Background characteristic	**NFHS-2 Rural**	**NFI survey**	**NFHS-2 Rural**	**NFI study**
Type of house				
Kutcha	8.1	12.3	30.6	21.2
Semi pucca	62.2	21.3	45.0	21.2
Pucca	29.5	66.3	24.3	57.6
Missing	0.1	0.0	0.1	0.0
Source of drinking water				
Piped	35.7	53.1	65.7	97.1
Hand pump	46.9	35.2	9.5	0.0
Well water	17.0	11.7	18.6	1.2
Surface water (tube well)	0.1	0.0	5.7	0.0
Other (stream/canal/river)	0.3	0.0	0.4	1.8
Sanitation facility				
Sanitary latrine	11.1	10.0	17.6	51.2
Pit toilet/Manually cleaned latrine	8.2	22.0	2.3	47.1
No facility	80.7	68.0	80.1	1.8
Electricity				
Yes	85.0	83.7	96.9	98.8
No	15.0	16.3	3.1	1.2
Main type of fuel used for cooking				
Wood	74.1	65.2	70.8	41.2
Kerosene	3.7	1.8	4.5	25.3
Liquid petroleum gas (LPG)	9.5	33.0	24.5	33.5
Others	12.7	0.0	0.0	0.0
Exposure to mass media				
Newspaper	11.5	7.0	23.7	87.6
Radio	26.1	49.7	55.7	32.9
Television	50.3	61.0	71.7	40.0
Standard of living index				
Low	15.8	22.0	13.5	15.3
Medium	55.0	53.3	63.0	71.8
High	28.7	24.7	22.7	12.9
Missing	0.6	0.0	0.8	0.0

Annexure 3

Household profile comparison of NFI & NFHS-2(rural) surveys in Assam, MP & Orissa state

	Assam		Madhya Pradesh		Orissa	
Profile of the women	**NFHS-2 Rural**	**NFI survey**	**NFHS-2 Rural**	**NFI study**	**NFHS-2 Rural**	**NFI study**
Age (yrs)						
15-19	9.9	14.2	14.5	11.2	7.0	6.7
20-24	18.3	37.8	19.6	47.9	18.9	38.6
25-29	19.5	30.2	19.6	32.5	20.8	34.9
30-34	18.8	14.2	16.1	5.9	18.3	16.1
35-39	13.5	1.3	13.6	2.4	13.4	3.4
40-44	10.3	1.8	9.5	0.0	12.3	0.3
45-49	9.7	0.4	7.1	0.0	9.3	0.0
Education of women						
Illiterate	56.7	45.3	77.8	68.0	62.2	46.3
Literate,< primary school	12.4	16.4	5.0	7.7	9.8	10.1
High school complete	28.2	31.6	15.7	22.5	25.9	35.9
Higher secondary complete & above	2.6	6.7	1.5	1.8	2.1	7.7
Religion						
Hindu	61.7	69.3	95.5	95.9	97.3	99.0
Muslim	34.4	28.0	2.3	3.6	1.2	0.3
Christian	2.4	2.7	1.4	0.0	1.4	0.7
Jain	0.0	0.0	0.5	0.6	0.0	0.0
Others	0.4	0.0	0.3	0.0	0.0	0.0
Caste/tribe						
Scheduled caste	9.9	8.0	15.0	13.6	21.7	42.3
Scheduled tribe	21.5	21.8	28.4	15.4	21.0	7.0
Backward caste	11.6	27.6	41.2	58.0	30.8	43.6
Other	54.6	42.6	15.5	13.0	26.4	7.0
Work status of women						
Working in family farm/ business	4.9	0.9	33.1	31.4	7.5	4.3
Employed by someone else	11.2	5.8	29.9	24.3	16.6	9.4
Self-employed	4.4	4.0	2.8	0.6	7.5	2.0
Not worked in past 12 months (Housewife)	79.5	89.3	34.2	43.8	68.4	84.2
Husband's education						
Illiterate	38.7	37.8	38.2	31.4	35.3	28.9
Literate,< primary school	17.0	16.0	11.5	11.8	14.2	12.4
High school complete	36.1	34.7	40.1	47.3	43.9	47.3
Higher secondary complete & above	0.5	11.5	9.9	9.5	6.5	11.4
Missing	0.0	0.0	0.4	0.0	0.0	0.0
Type of family						
Nuclear	57.1	52.9	55.8	49.7	62.3	40.9
Joint	42.9	32.9	44.1	34.3	37.7	30.4
Extended nuclear	0.0	14.2	0.0	16.0	0.0	22.1

	Assam		Madhya Pradesh		Orissa	
Background characteristic	**NFHS-2 Rural**	**NFI survey**	**NFHS-2 Rural**	**NFI study**	**NFHS-2 Rural**	**NFI study**
Type of house						
Kutcha	54.8	78.7	4.7	46.2	55.3	71.5
Semi pucca	37.4	15.1	86.6	39.1	33.2	19.1
Pucca	7.6	6.2	8.6	14.8	11.5	9.4
Missing	0.0	0.0	0.0	0.0	0.1	0.0
Source of drinking water						
Piped	7.1	10.2	10.9	30.5	3.9	11.5
Hand pump	50.6	58.2	43.3	36.4	59.5	67.4
Well water	30.4	18.2	42.0	22.5	27.8	21.2
Surface water (tube well)	11.8	0.0	3.8	0.0	8.8	0.0
Other (stream/canal/river)	0.1	13.1	0.4	1.8	0.0	0.0
Sanitation facility						
Sanitary latrine	10.0	4.0	6.6	24.9	6.2	6.0
Pit toilet/Manually cleaned latrine	49.6	66.7	1.2	0.6	2.1	4.7
No facility	40.4	29.3	92.3	74.6	91.7	89.3
Electricity						
Yes	21.1	20.4	59.6	87.6	28.7	31.9
No	78.9	79.6	40.4	12.4	71.3	68.1
Main type of fuel used for cooking						
Wood	90.9	80.4	88.0	89.3	70.9	95.3
Kerosene	0.3	16.9	1.9	3.0	1.6	2.3
Liquid petroleum gas (LPG)	6.0	2.7	2.4	7.7	1.4	2.3
Others	2.8	0.0	7.5	0.0	26.1	0.0
Exposure to mass media						
Newspaper	13.9	5.3	9.1	0.6	8.4	6.0
Radio	24.3	29.8	25.2	2.4	32.0	39.6
Television	39.3	20.0	32.5	33.1	22.9	32.6
Standard of living index						
Low	48.4	24.9	42.4	22.5	62.6	60.4
Medium	40.8	45.8	48.9	50.9	30.7	33.2
High	7.8	29.3	8.4	26.6	6.3	6.4
Missing	3.0	0.0	0.3	0.0	0.4	0.0