NNMB Technical Report No. 22

NATIONAL NUTRITION MONITORING BUREAU

PREVALENCE OF MICRONUTRIENT DEFICIENCIES

NATIONAL INSTITUTE OF NUTRITION
Indian Council of Medical Research
HYDERABAD – 500 007
2003

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Executive Summary

The present survey was carried out to assess the prevalence of common micronutrient deficiencies such as vitamin A deficiency (Bitot spots) among the preschool children (1-<5 years), Iodine deficiency disorders among the 6-<12 year children and the levels of haemoglobin among preschool children, adolescent girls (12-<18 years) and pregnant & lactating women in the rural communities by covering statistically adequate sample. In addition, the awareness about IDA & VAD among women and the coverage of target beneficiaries for the distribution of iron and folic acid tablets and massive dose of vitamin A under the National nutrition programmes was assessed. Iodine content of cooking salt samples collected from a sub-sample of households (HHs) was determined using spot testing kits. The study was carried out in the States of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Madhya Pradesh, Orissa and West Bengal. In each State, the same eighty villages surveyed for diet and nutrition assessment during 2000-2001, were covered. These villages were a sub-sample of the villages covered by the NSSO for 54th round of Consumer Expenditure Survey carried out during 1998.

The study revealed that the socio-economic and demographic profile of the population covered in the present survey was comparable to that of the population covered in NNMB surveys during 2000-2001. The overall prevalence of Bitot Spots was about 0.8%, which ranged from nil in the State of Kerala to a maximum of 1.2% to 1.4% in the States of Andhra Pradesh, Maharashtra and Madhya Pradesh. The prevalence of Bitot spots was comparable to the figures reported by the NNMB in 2000-2002 (0.8%) and the district level micronutrient survey by ICMR (0.7%). The prevalence was above the WHO criterion of 0.5% in all the States except in Kerala and Orissa. The overall prevalence of total goiter among 6-<12 year children was about 4%. The prevalence was more than the WHO criterion of 5%, only in the State of Maharashtra (11.9%) and West Bengal (9%), In general, about 42% of the HHs were using un-iodized salt, while about 31% of the HHs were consuming salt which had satisfactory levels of iodine (≥15 ppm).

The mean haemoglobin levels among different age/sex/physiological groups were much below the cut-off points suggested by WHO to diagnose anaemia. The overall prevalence of anaemia was observed to be highest among lactating women (78%), followed by pregnant women (75%), adolescent girls (about 70%) and preschool children (67%). However, the prevalence of moderate to severe anaemia was found to be highest among pregnant women (50%), followed by preschool children (43%), lactating women (35%) and adolescent girls (about 23%). The

overall prevalence of anaemia was observed to be relatively higher in the states of West Bengal (95.9%) and Orissa (91.2%).

Only about 41% of the mothers of 1-5 year children were aware of night blindness. About 30% of the index children reportedly received one dose of massive vitamin A, while about 25% received two doses during the previous one year. Only about 1% of those children who received the massive dose of vitamin A, reportedly experienced side effects such as fever/vomiting (0.3%) or nausea (0.1%). Only about 13% of the women said that they received nutrition education on VAD.

Only about a third of women (33.9%) were aware of anaemia. Twenty six percent of the women identified dietary inadequacy as the cause of anaemia, while about 4-5% each attributed it to blood loss or deficiency of iron. About a third of the women (29.7%) said that they would prefer to consult a doctor, in case of anaemia. Only 14% of the women reportedly received nutrition education on iron deficiency anaemia, either from health functionaries or Anganwadi workers.

The coverage of target beneficiaries for the distribution of iron and folic acid tablets under anaemia prophylaxis programme was in general poor and ranged from a very low 3.8% among preschool children, through 12.3% among lactating mothers to about 62% among pregnant women. The proportion of pregnant women who reportedly received recommended 90 or more IFA tablets was very low (29%). About 9% pregnant women, 4% lactating women and 0.3% of preschool children reportedly experienced side effects on consumption of IFA tablets.

Thus, the present survey perhaps carried out for the first time covering statistically adequate sample size in major States revealed that, though the prevalence of severe forms of vitamin A deficiency such as corneal ulcers/keratomalacia has in general become rare. However, the prevalence of Bitot spots (0.8%), the milder form of VAD, was above WHO cut-off levels (0.5%) in six out of eight states surveyed.

The overall prevalence of total goiter among 6-<12 year children was about 4%, which is below the level indicating endemicity of the problem. The findings are comparable with the recent study conducted by ICMR in the year 2002 (4.8%). However, in the States like Maharashtra (11.9%) and West Bengal (9%), the prevalence was found to be more than the WHO cut-off level of 5%. The overall prevalence of anaemia, as per WHO criteria among various target groups was very high and ranged from 70-80%.

The prevalence of Bitot Spots and anaemia was relatively higher in the HHS belonging to SC/ST communities, those engaged in agricultural and other labour,

the HHs with an illiterate adult female and those without sanitary latrine.

Evaluations of National nutrition programmes carried out in the past have revealed failure of the National Nutrition programmes in achieving the set objectives. The present study also shows that the coverage of target groups for distribution of massive dose of vitamin A and iron & folic acid tablets was very low. While about 58% of the HHs was using iodised salt, only a third of the HHs was consuming adequately iodized salt (≥15 ppm).

The study also reiterated the earlier observations that the nutrition education component is unsatisfactory, covering a mere 14% of the target beneficiaries. These results thus, point out that there is an urgent need to energize our focus on proper implementation of the existing national nutrition programmes and strengthening nutrition education component.

1. INTRODUCTION

The National Nutrition Monitoring Bureau (NNMB), established in the year 1972 under the aegis of the Indian Council of Medical Research (ICMR) in the States of Andhra Pradesh, Gujarat, Karnataka, Kerala, Madhya Pradesh, Orissa, Tamil Nadu, Maharashtra, Uttar Pradesh and West Bengal, has been carrying out regularly, since its inception, annual surveys on diet and nutritional status of the population and the results have been published in the form of technical reports. The results of the surveys carried out till the year 1997 were compiled as a publication entitled *`25 years of National Nutrition Monitoring Bureau'* (1997) [1]. The NNMB, between the years 1972 and 2000, collected data mainly on dietary pattern at household as well as individual levels, nutritional anthropometry and clinical examination of individuals of different age, sex and physiological groups. This has remained the major database on diet and nutritional status of the community.

During the past decade, micronutrient deficiencies have been attracting attention of both academicians and administrators. In India, the micronutrient deficiencies of public health significance are vitamin 'A' deficiency (VAD), iron deficiency anaemia (IDA) and iodine deficiency disorders (IDD). There have been no systematic surveys in different States, to assess their prevalence, covering adequate sample size. This has been due, perhaps, to the fact that, it is often difficult to cover a large and more importantly, statistically adequate sample to assess the prevalence of micronutrient deficiencies among the vulnerable segments of the rural population in the routine nutrition surveys carried out in different parts of the country.

Therefore, the present survey was carried out to assess the prevalence of common micronutrient deficiencies among the vulnerable groups of rural population covering statistically adequate sample in each of the NNMB States.

2. OBJECTIVES

2.1. GENERAL OBJECTIVE

The general objective was to assess the current status of micronutrient deficiencies among vulnerable groups of rural population in NNMB States.

2.2. SPECIFIC OBJECTIVES

The specific objectives were,

1. To assess the prevalence of clinical forms of vitamin A deficiency (particularly Bitot spots) among the pre-school children in the rural areas of the States covered by NNMB,
2. To estimate haemoglobin levels among preschool children, adolescent girls and pregnant & lactating women,

3. To assess the clinical prevalence of IDD in the age group of 6-<12 year children,
4. To estimate iodine levels in the salt samples collected from the households, using spot testing kit,
5. To estimate serum vitamin A levels in preschool children using dry blood spot (DBS) technique, and
6. To assess the awareness of women about IDA & VAD and the coverage of the target beneficiaries for the supplementation of iron & folic acid tablets, and massive dose of vitamin A under the national programmes, with particular reference to coverage and regularity.

3. METHODOLOGY

3.1. INVESTIGATIONS

The following investigations were carried out:

3.1.1. Clinical examination

3.1.1.1. Vitamin A Deficiency

Clinical examination was conducted on 1-5 year children to find out the ocular manifestations of vitamin A deficiency such as night blindness (XN), conjunctival xerosis (X1A), Bitot spots (X1B), corneal xerosis (X2), corneal ulcer (X3A) and Keratomalacia (X3B).

3.1.1.2. Iron Deficiency Anaemia

The prevalence of clinical signs of IDA such as pallor and koilonychia was assessed among the target groups viz., preschool children, adolescent girls of 12-<15 and 15-<18 years, pregnant women of ≥6 months and lactating mothers of < 6 months.

3.1.1.3. Iodine Deficiency Disorders

Prevalence of clinical forms of IDD such as goiter, cretinism, deaf-mutism, mental retardation etc. was assessed among 6-<12-year children.

3.1.2. Estimation of haemoglobin levels

The haemoglobin levels were estimated among target groups, by cyanmethaemoglobin method, using colorimetry[2]. For the purpose, 20 μL of finger prick blood sample was collected using fixed volume Finn pipette and transferred into a test tube containing 5 ml of Drabkin's reagent. The haemoglobin level was estimated using a photoelectric digital colorimeter. Commercial haemoglobin kits (Dr. Reddy's Laboratories or Glaxo Laboratories) were used for the purpose of estimations.

3.1.3. Estimation of serum vitamin A levels

Blood vitamin A levels, among a sub-sample of preschool children was assessed by dry blood spot technique (DBS), using HPLC (Neal E. Craft et. al.) [3], at the National Institute of nutrition (NIN).

For this purpose, a free falling drop of blood from finger-prick was collected on a pre-coded special chromatography paper. It was shade dried and wrapped in black paper and transported to NIN for the estimation of vitamin A. The samples were protected from light and preserved in a deep freezer till the time of analysis.

3.1.4. Testing of cooking salt for iodine content

Iodine content of cooking salt samples collected from a sub-sample of households (HHs) wherein 6 - <12 year children were covered for prevalence of IDD, was assessed using spot testing kits[4] developed by NIN.

3.1.5. Knowledge and practices about IDA and VAD

Pre-tested questionnaire was administered on women in a sub-sample of households having various target beneficiaries, to assess their awareness about IDA and VAD. In addition, information on the extent of coverage of target individuals for the supplementation of massive dose of vitamin A and iron-folic acid distribution, under the National Nutrition Programmes, was also collected.

3.2. SAMPLE SIZE

The procedure adopted for computing sample size required for various investigations per State, is described below:

3.2.1. Vitamin A Deficiency

3.2.1.1 Prevalence of Clinical forms of VAD

The prevalence of Bitot spots (X1B), an objective sign of vitamin A deficiency among preschool children, as reported in the earlier NNMB surveys was considered for computing sample size for estimating the current prevalence of VAD in the rural communities in each State. Thus, assuming a current prevalence of 1% of Bitot spots, confidence interval (CI) of 95% and a relative precision of 20%, a sample size of 9,508 preschool children per State, was arrived at.

Assuming that 1-<5 years children constitute about 10% of total population, a population of 95,000 or approximately 23,750 households (HHs) (assuming an average family size of 4) was the target to be covered in each State. Since, the proportion of preschool children may vary from State to State; it might have necessitated coverage of more number of households or population than presumed, in different States.

3.2.1.2. Estimation of Blood Vitamin A levels

The available literature indicated that the average prevalence of low blood vitamin A levels (<20μg/dl) among preschool children was about 40%. Thus, assuming a current prevalence of low blood vitamin A levels of 40%, with 95% of CI and a relative precision of 10%, a sub-sample of 576 preschool children who were covered for clinical examination, were covered for estimation of blood vitamin A levels.

3.2.2. Iron Deficiency Anaemia - Estimation of haemoglobin levels

A prevalence of 70% of anaemia was considered for the calculating sample size for the estimation of haemoglobin levels among different target groups. Thus, assuming a prevalence of anemia of 70%, 95% of CI and a relative precision of 10%, a sample size of 336 individuals in each of the target groups was arrived at, for the estimation of haemoglobin levels.

3.2.3. Iodine Deficiency Disorders

3.2.3.1. Assessment of Prevalence of clinical forms of IDD

The prevalence of goiter was assumed to be about 10% among 6-<12 year children. Thus, assuming a current total goiter rate (TGR) of 10%, CI of 95% and a relative precision of 10%, a sample size of 3,457 children of 6-<12 years per State was computed, for the estimation of IDD.

3.2.3.2. Testing *of Household Cooking Salt for iodine content*

Cooking salt samples were collected from 10 HHs (@ two HHs in each of the five geographical areas) in each village (800 HHs per State), wherein 6-<12 year children were covered for clinical examination of IDD. Iodine levels in these samples were assessed, using 'spot testing kits' developed at NIN[4].

3.2.4. Knowledge and Practices on IDA and VAD

Information on knowledge and practices (K&P) about IDA and VAD and distribution of IFA tablets and massive dose vitamin A during the previous one-year or current beneficiary status was collected using pre-coded questionnaires, on a sub-sample of mothers of preschool children, pregnant women and lactating mothers. K&P on IDA was assessed on every alternate individual covered for haemoglobin estimation among 1-<5 years preschool children (mother being respondent), pregnant women and lactating mothers. For assessing K&P on VAD, questionnaires were administered on mothers of every 50th child of 1-<5 year age group covered for clinical examination for VAD.

The sample size required for different investigations among various target groups of individuals is given in the following table.

Sample size computed for different investigations for each State

Investigations		Age (years) sex and Physiological groups	Sample Size required per State
VAD	a) Clinical Examination	1-<5	9508
	b) Serum Vitamin A	1-<5	576
IDA	a) Clinical Examination b) Estimation of Haemoglobin	1-<5	336
		Adolescent Girls (12-<15)	336
		Adolescent Girls (15-<18)	336
		Pregnant Women (≥6 months)	336
		Lactating Women (<6 months)	336
IDD	a) Clinical Examination	6-<12	3457
	b) Spot Test of Salt for Iodine Content	Households (@10HHs/vil.)	800
K&P	IDA (1-<5 year children, Pregnant & Lact. women)	Every alternate individual, covered for haemoglobin estimation.	
	VAD (1-<5 yr children)	Every 50th child covered for clinical VAD	

Number of target individuals to be covered for each investigation in each village was determined on the basis of population proportion to size of the village. The individuals in a village were selected by using systematic random sampling method.

3.3. SAMPLING PROCEDURE

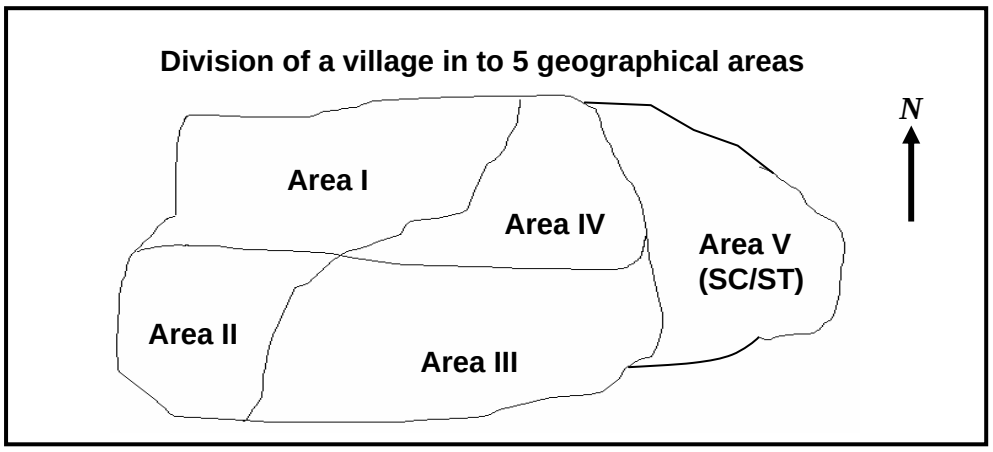
The sampling procedures were discussed and finalized in the Steering Committee meeting of NNMB (2001). The survey was carried out in each State, in the same eighty villages covered for rural diet and nutrition survey[5] carried out during 2000-2001. These villages were a sub-sample of the villages covered by the National Sample Survey Organization (NSSO), for the 54th round of 'Consumer Expenditure Survey' carried out in 1998[6].

The NSSO adopts a two stage stratified random sampling method in which the villages formed the first stage units (FSU), while the households (HHs) formed the second stage units (SSU). For the purpose, each State was divided into different agro-economic regions. Each region within a State consisted of groups of contiguous districts having similar cropping pattern and population density.

A district or part of the district with rural population of less than 1.8 millions formed one stratum. Districts with rural population of more than 1.8 million were divided into two or more strata by grouping contiguous *taluks/tehsils* having similar cropping pattern and population density.

3.3.1. Selection of Households

The households in each village were selected by adopting cluster-sampling procedure. For the purpose, the entire village was divided into five geographical areas based on natural groups of houses, streets or *mohallas*. Households belonging to SC/ST community, who generally live in a group, constituted one of the five areas, as shown in the figure below:



3.4. CALIBRATION OF THE COLORIMETER AND HAEMOGLOBIN PIPETTES

The colorimeter was calibrated each time before and in between taking the actual readings. All the glass haemoglobin pipettes used for collecting duplicate blood samples to be sent to NIN on filter paper were calibrated at the NIN using standard procedures, to ensure that the volume of blood drawn would be exactly 20 μL.

3.5. TRAINING AND STANDARDIZATION OF THE INVESTIGATORS

The Medical Officers, Nutritionists and Social Workers of all the NNMB Units were given a two-week orientation-cum-standardization training at NIN, in the techniques of collection of finger-prick blood samples, estimation of haemoglobin and administration of K&P schedules. During the training, emphasis was given in achieving the maximum intra and inter-observer agreement in respect of assessment of clinical signs of VAD, IDD and the estimation of haemoglobin.

For the purpose of standardization in the clinical diagnosis of IDD and VAD, the investigators were taken to villages about 100 km away from Hyderabad. For standardization in haemoglobin estimation, all the investigators were made to collect finger prick samples every day at least on five individuals, adopting Latin Square design. This process was repeated for a minimum of seven days or until the differences in OD (Optical Density) or haemoglobin between the standard (Trainer) and investigators were within the allowable range (<0.02 OD).

After the initial training, each team carried out 'mock surveys' in their respective States. The proformae were then finalized, considering their experiences

in the mock surveys. One-week *reorientation training programme* was organized for the teams at NIN, before they initiated actual surveys.

During the training programme, to assess the effectiveness of the standardization, intra-class correlations were computed to find out the agreement (consistency) between the haemoglobin values estimated by the investigators and the standard at the end of both the sessions of training (Time 1 and Time 2). The results revealed that the intra-class correlation coefficients at both the time points were highly significant (r_i = 0.92 & 0.94), indicating good agreement.

3.6. QUALITY CONTROL

To ensure quality control in the estimation of haemoglobin, every 10th sample was collected in duplicate by the investigators. While every alternate duplicate sample was anlayzed by NNMB team to ensure internal consistency, the remaining duplicate samples were collected on to Whatman No.1 filter paper, using glass haemoglobin pipettes. These were sent immediately by courier to NNMB (CRL) for analysis to ensure inter-lab consistency.

In haemoglobin estimations, the overall intra individual variation was nil (i.e., duplicates with same OD) in about 59% of the duplicate samples analyzed, while in 39%, it was ±0.01 OD **(Table 1.1)**. It may be mentioned that the accuracy of measurement is 0.01 OD. In terms of haemoglobin values, the intra-individual variation was less than ±0.5 g/dl in 97% of duplicate samples, while it was 0.5 to 1.0 g/dl in 2.3% of the samples (**Table 1.2**). During the survey, the intra class correlation was 0.82, indicating good agreement between the haemoglobin estimations by NIN and investigators **(Fig. 1).**

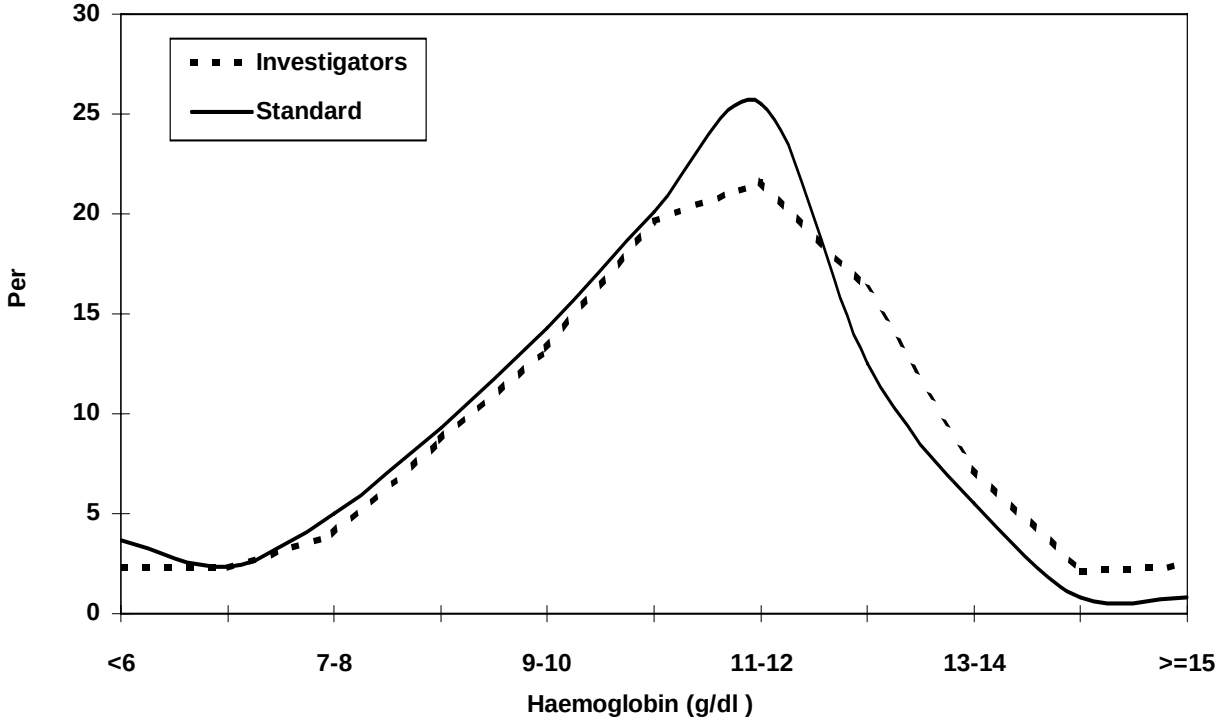
Scientists of CRL made regular visits to each State and carried out random checks on 5% of the sample, covered by the teams on the previous day of their visit. Finger prick blood samples collected as Dry blood spots are preserved at NIN and are yet to be analysed. Hence, the results of the same are not included in the present report.

4. RESULTS

4.1. COVERAGE

A total of 75,600 HHs from 633 villages in the States of Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, Maharashtra, Madhya Pradesh, Orissa and West Bengal were covered for various investigations in the present survey. The survey in Gujarat and Uttar Pradesh was disrupted due to manpower problems. In the States of Andhra Pradesh, Karnataka, Kerala, Orissa, Tamil Nadu and West Bengal, the survey was completed in all the targeted number of villages. In the State of Madhya Pradesh,

Fig. 1
Comparison between Haemoglobin estimations by the Investigators Vs Standard during the survey



however, only 94% of villages (75/80) could be surveyed, since the unit had to participate in adhoc drought surveys in two States. The particulars of coverage for various investigations in each State are presented in **Table 2, Fig. 2** and are discussed below.

4.1.1. Vitamin A Deficiency

A total of 71,591 preschool children were covered for clinical assessment for vitamin A deficiency (VAD). The coverage was about 100% in the States of Orissa, Andhra Pradesh, West Bengal, about 95% in the States of Tamil Nadu, and Maharashtra, about 90% in Karnataka, and Kerala and 80% in the State of Madhya Pradesh.

4.1.2. Haemoglobin Estimation

A total of 3,291 preschool children, 6,616 adolescent girls, 2,983 pregnant women (≥ 24 weeks) and 3,206 lactating mothers (<6 months) were covered for haemoglobin estimation. The coverage was marginally higher than the target for various age/sex/physiological groups, in all the States.

4.1.3. Iodine Deficiency Disorders

A total of 28,437 children of 6 -<12 year age group were covered for clinical assessment of IDD. The coverage was marginally lower than the target in Madhya Pradesh and Karnataka, while it was satisfactory in the rest of the States.

4.1.4. Testing of Household Cooking Salt for Iodine Content

A total of 5209 salt samples collected from the households were tested for iodine content by using spot testing kit. The number of samples collected was less than the target of 800 in all the States and ranged from a low 559 in Kerala to a maximum 720 in the State of Andhra Pradesh.

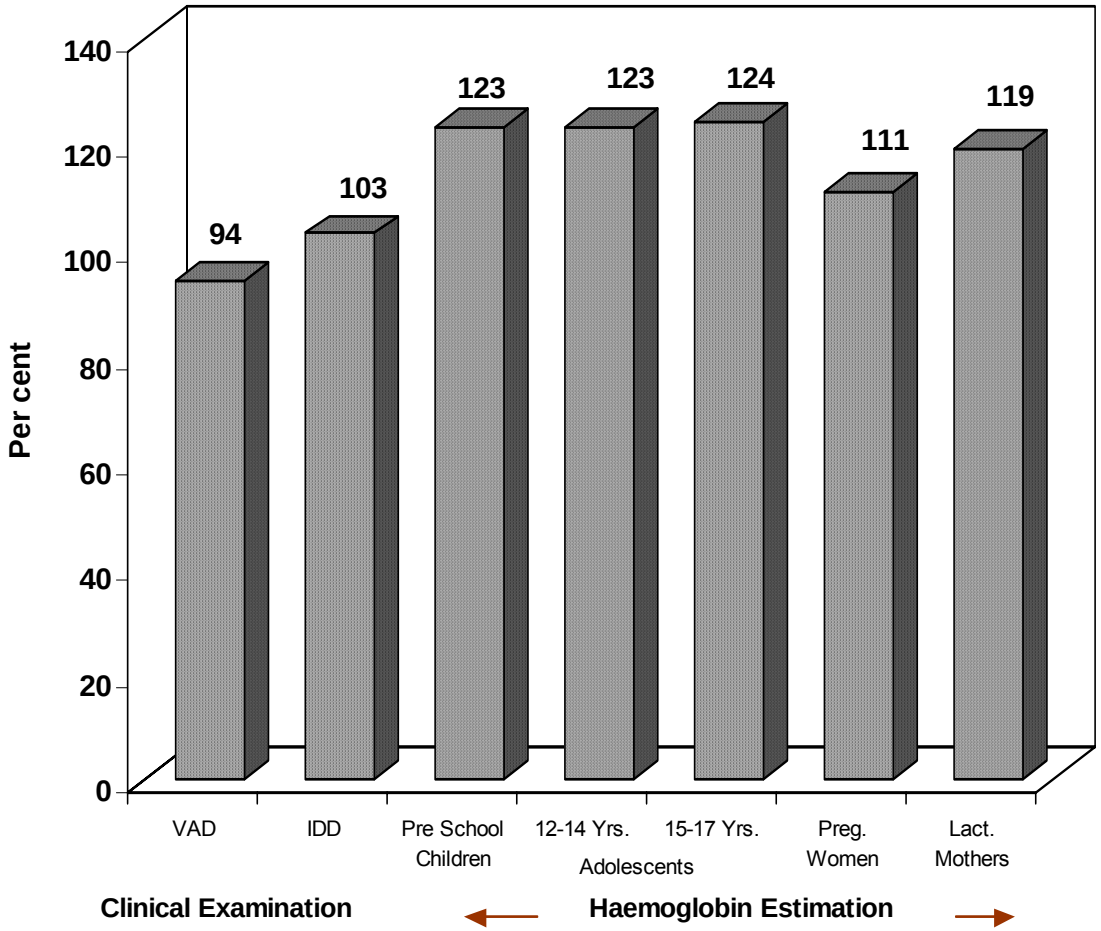
4.1.5. Knowledge and Practices

Knowledge and practices on VAD were assessed on 2,681 mothers of index children of 1-<5 years of age, while K&P on IDA was assessed on 2,178 mothers of index children of 1-<5 years of age, 2,053 pregnant women (≥ 24 weeks) and 2,213 lactating mothers (<6 months). The sample covered for various categories of respondents was found to be satisfactory, in all the States.

4.2 PROFILE OF THE SAMPLE COVERED

The socio-economic and demographic profile of the population covered in the present survey was comparable to that of the population covered during 2001-NNMB surveys **(Figs.2-5).**

Fig.2
Particulars of coverage (as % of Target)



4.2.1. Religion

A majority of the HHs covered for various investigations belonged to Hindus (86%), followed by Muslims (10%) and Christians (4%) (**Table 3, Fig. 3**). The proportion of Muslim households was relatively higher in the States of Kerala (28.6%) and West Bengal (20.5%), compared to other States.

4.2.2. Community

About 43% of the HHs surveyed, belonged to Other Backward Communities (OBCs) and about 29% HHs belonged to Scheduled caste/Scheduled tribe communities. The proportion of tribal households was relatively higher in the States of Madhya Pradesh (27.4%) and Orissa (17.5%), while the proportion of Scheduled caste HHs was higher in the State of West Bengal (29%), Andhra Pradesh (25.2%) and Tamil Nadu (23.6%). About three fourths of HHs belonged to OBCs in the States of Tamil Nadu (76%) and Kerala (71.5%) (**Fig. 4**).

4.2.3. Occupational status

The major occupation in about 45% of the HHs was either agricultural labour (16.5%) or other labour (28.6%). Agriculture was major occupation in about 27% of the HHs, while about 21% were engaged in either 'service' (10.4%) or business (10.2%). The proportion of HHs engaged in agricultural labour was very low in the State of Orissa (1%), Kerala (4.5%) and Madhya Pradesh (8.5%), while in Andhra Pradesh (33.2%), they constituted a third of the total sample covered. The proportion of HHs engaged in non-agricultural activities such as other labour (42.1%) and business/services (39%) was relatively higher in the State of Kerala compared to other States (**Table 4, Fig. 5**).

4.2.4. Adult Female Literacy

The overall adult female literacy rate in the HHs surveyed was observed to be about 51%. The proportion of illiterate women was higher in the States of Madhya Pradesh, and Karnataka (about 70-75%), followed by Andhra Pradesh and Orissa (about 58-63%), Tamil Nadu and West Bengal (48-53%) and Maharashtra (41%). In contrast, nearly 95% of the adult females in Kerala were literate (**Table 5, Fig.6**).

4.2.5. Family Size

The average family size pooled for the States was 4.84 (CI: 4.83 – 4.85). It was relatively higher for the States of Madhya Pradesh (5.6), Karnataka (5.5) and Maharashtra (5.3), and was least for the State of West Bengal (4.1) (**Table 6**). The proportion of families with family size of <4 was relatively higher in West Bengal (69.3%), and lower in the States of Karnataka (34.8%), Maharashtra (33.3%) and Madhya Pradesh (32%). The proportion of HHs with family size >8 ranged from a

Fig. 3 **Distribution (%) of HHs by Religion**

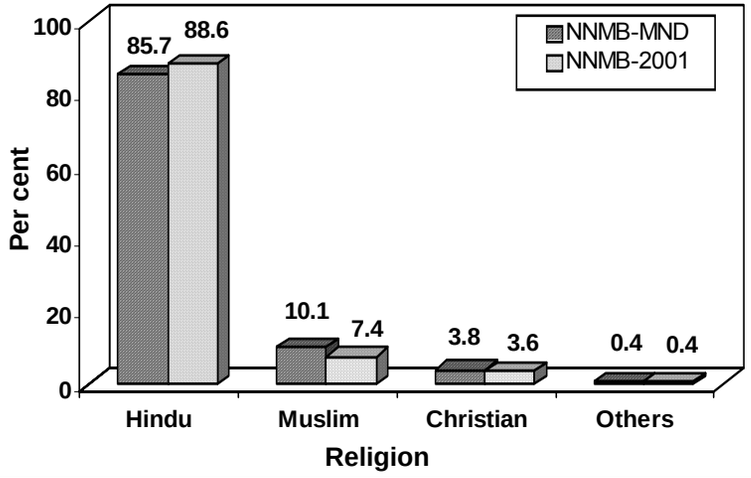


Fig. 4 **Distribution (%) of HHs by Community**

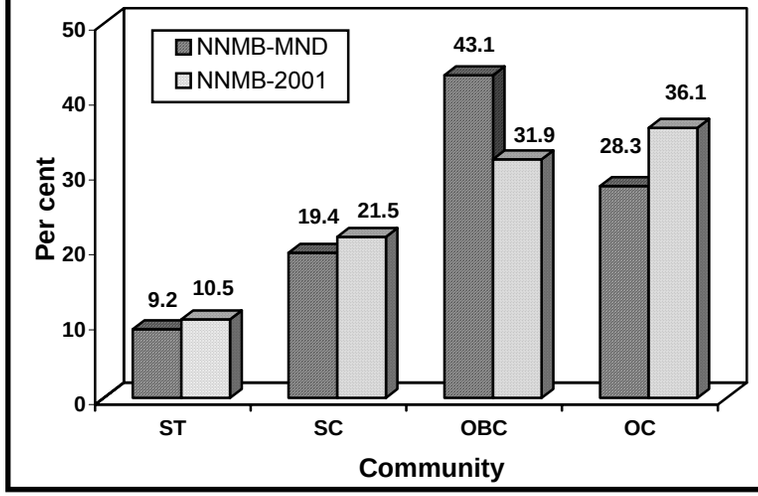


Fig. 5 **Distribution (%) of HHs by Occupation**

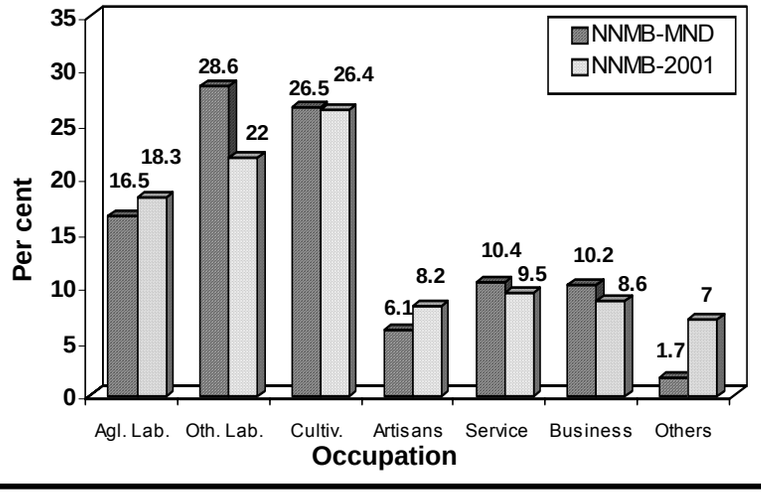
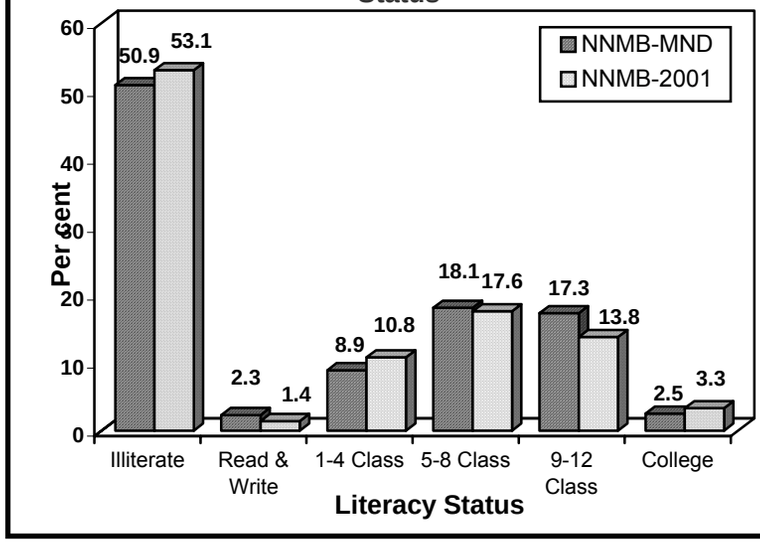


Fig. 6 **Distribution (%) of HHs by Adult Female Literacy Status**



maximum of about 18-19% in the States of Karnataka and Madhya Pradesh to a low 2% in the States of Andhra Pradesh and West Bengal.

4.2.6. Sanitary latrine

In general, only about a fourth of the HHs (27%) had sanitary latrine. A majority of the households in the State of Kerala (94%) had sanitary latrine. In contrast, their proportion in the rest of the States ranged from a low 8-9% in Orissa and Madhya Pradesh to about 16-18% in Maharashtra, Andhra Pradesh, Karnataka and 20% in Tamil Nadu (**Table 7**).

4.3. Prevalence of Clinical signs of Micronutrient Deficiencies

4.3.1. Vitamin A Deficiency (VAD)

The overall prevalence of Bitot spots among 1-5 year children, an objective sign of vitamin A deficiency was about 0.8% (CI : 0.73 – 0.87), which ranged from nil in the State of Kerala to a maximum of 1.4% (CI: 1.15 – 1.65) in the State of Madhya Pradesh followed by 1.3% in Maharashtra and 1.2% in Andhra Pradesh. The prevalence was >0.5%, a cut-off level recommended by WHO to indicate public health significance, in all the States except Kerala and Orissa **(Table 8, Map 1).** The overall prevalence of night blindness was about 0.3% (CI: 0.26 – 0.34) and that of conjunctival xerosis was about 1.8%. It may be mentioned that quite often assessment of night blindness is difficult in routine surveys. The prevalence of Bitot spots was comparable to that observed in the earlier NNMB survey (2002)[5] (0.8%) and the district micronutrient survey of ICMR[7] (0.7%) **(Fig.7)**.

4.3.2. Iodine Deficiency Disorders (IDD)

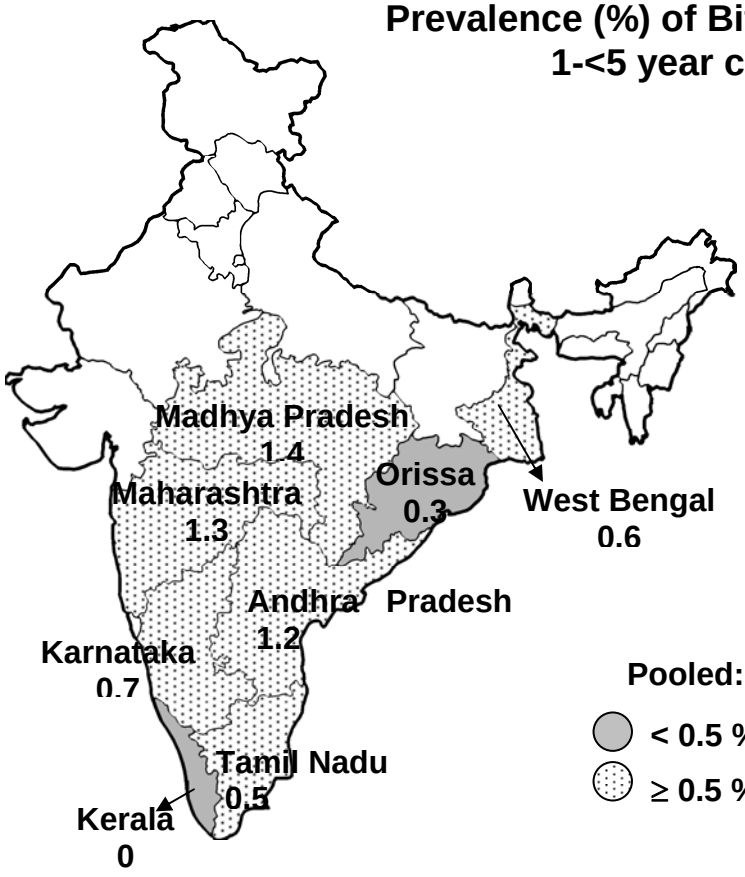
The overall prevalence of total goitre among 6-<12 year children was about 4%. The proportion was higher than the WHO criterion of 5%, only in the States of Maharashtra (11.9%) and West Bengal (9%) (**Map. 2).** The prevalence of deaf-mutism and mental retardation was negligible (0.1% in each) **(Table 9, Fig. 8)**.

4.4. Iodine content in Salt samples collected from Households

The spot test revealed that, in general about 42% of HHs were consuming un-iodized salt, while in 31% of the HHs, the iodine content of the salt was as per the recommended level of ≥15 ppm. In about 27% of the HHs, the iodine content was unsatisfactory (about 7 ppm). The proportion of HHs consuming salt having satisfactory levels of iodine (≥15 ppm) was maximum in the States of West Bengal and Kerala (50-55%), followed by Andhra Pradesh, Maharashtra (about 30%), Tamil Nadu, Karnataka & Orissa (about 23-25%), with least being in the state of Madhya Pradesh (8.5%) **(Table 10**).

Map 1

Prevalence (%) of Bitot spots among 1-<5 year children



Map 2

Prevalence (%) of Goiter among 6 -< 12 year children

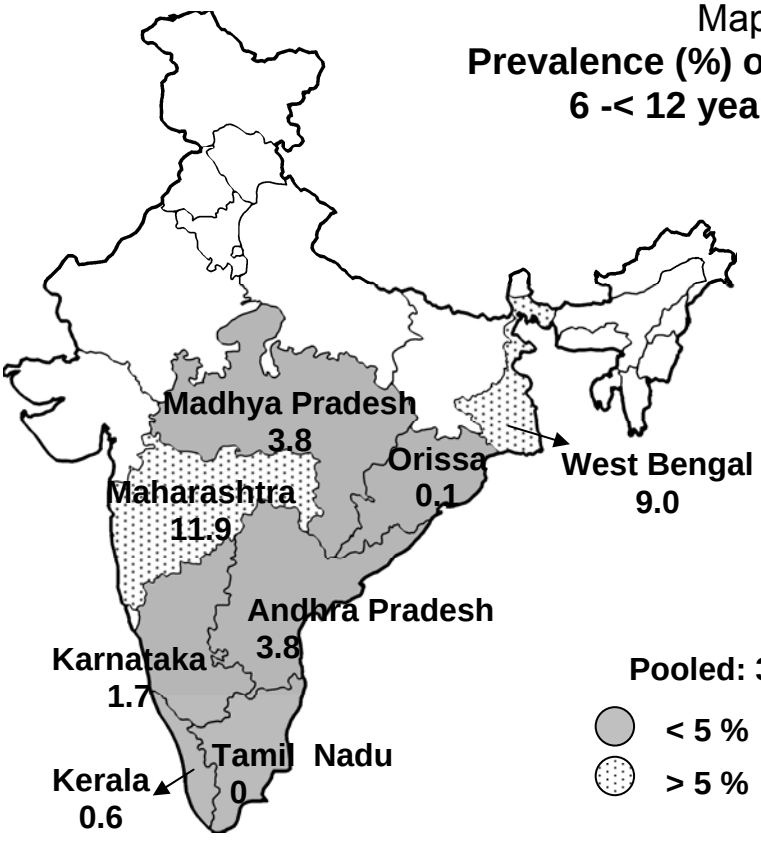
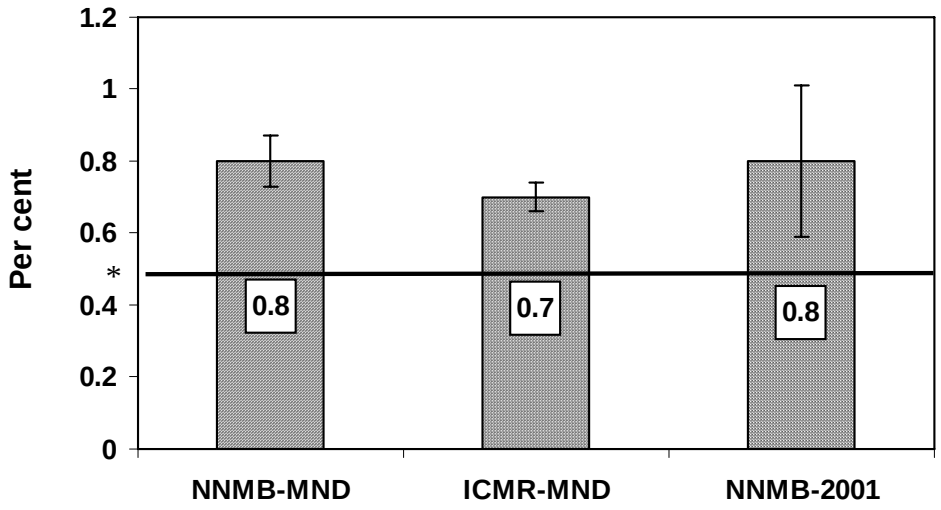
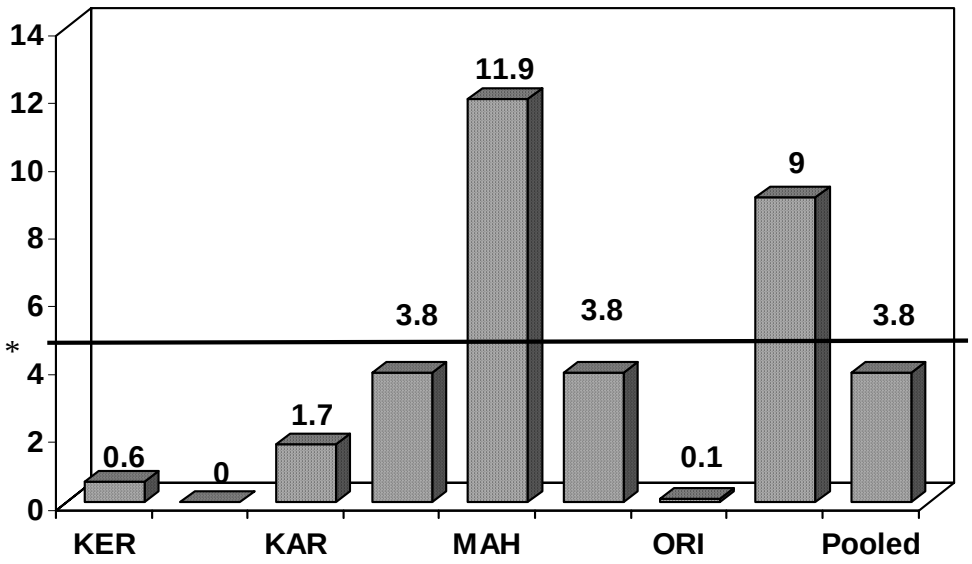


Fig. 7
Prevalence (%) of Bitot Spots among 1-<5 Yrs. children



* WHO cut-off level (0.5%) of Public Health significance

Fig. 8
Prevalence (%) of Goitre in 6-<12 Yrs. Children by States



* WHO cut-off level (5%) of IDD Endemicity

4.5. HAEMOGLOBIN LEVELS

The mean haemoglobin levels among different age/sex/physiological groups ranged from 9.9 to 11.2 g/dl. The lowest mean haemoglobin level was observed among pregnant women (9.9 g/dl), followed by preschool children (10.3 g/dl), lactating women (10.6 g/dl) and adolescent girls (11.1 to 11.2 g/dl). The mean haemoglobin levels among all the physiological groups were relatively higher in the State of Kerala, and in general least in the State of Orissa, compared to other States **(Table 11)**.

4.5.1. Prevalence of anaemia

The criteria suggested by the WHO were used to diagnose the extent and degree of anaemia. The cut-off values suggested for different physiological groups by the WHO[8] are presented below:

WHO Criteria of Anaemia – Haemoglobin Levels (g/dl)

Physiological Group	Normal	Degree of Anaemia		
		Mild	Moderate	Severe
Preschool Children & Pregnant women	≥11	10-11	7-10	<7
Lactating Women & Adolescent Girls	≥12	10-12	7-10	<7

Source: WHO (1989)

4.5.1.1. Preschool children

The overall prevalence of anemia among preschool children was about 67% (*CI: 65.3 – 68.5*), with about 41% having moderate anaemia and 2% having severe anaemia. Highest prevalence of anaemia was observed in the State of Orissa (92.4%), followed by West Bengal (81.2%) and Andhra Pradesh (70.8%) **(Table 12, Fig. 9 and Map 3)**.

4.5.1.2. Adolescent Girls

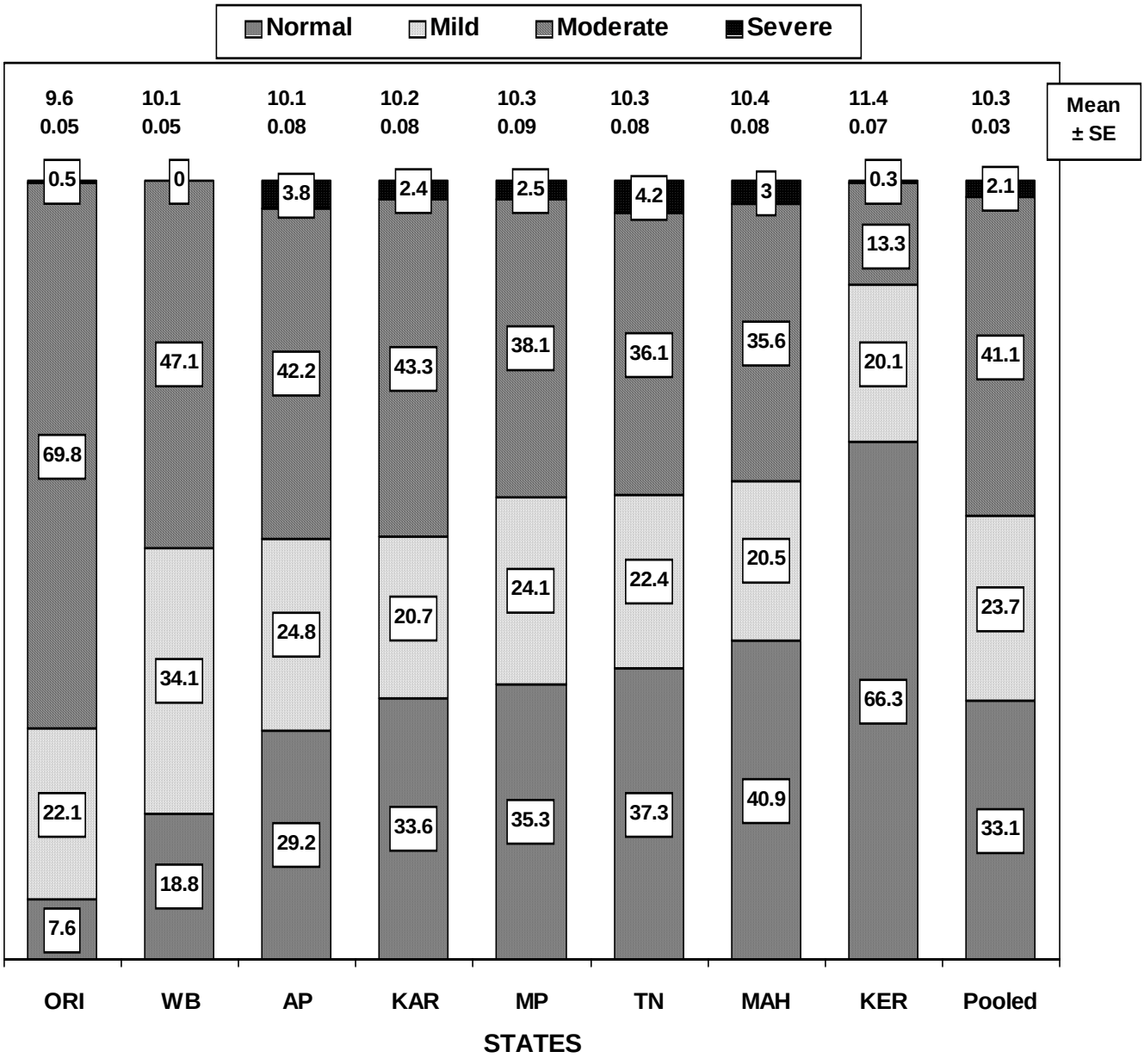
The overall prevalence of anaemia among 12-14 year adolescent girls was about 69% (*CI: 67.1 – 70.3*) **(Table 13, Fig.10.1 and Map 4)**. The prevalence among older adolescent girls (15-17 years) was observed to be about 70% (*CI: 68.1 – 71.3*) **(Table 14, Fig.10.2 and Map 5)**. The prevalence of moderate anaemia was about 21% and that of severe anaemia was about 1-2%. The overall prevalence of anemia among adolescents was relatively higher in the States of West Bengal (88-90%), Orissa (78-82%), Madhya Pradesh (72-76%) and Andhra Pradesh (73%).

4.5.1.3. Pregnant Women

About 75% of pregnant women, in general, were found to be anaemic (*CI: 72.9 – 76.1)*. The prevalence of moderate anaemia was about 46% and that of

Fig. 9

Prevalence (%) of Anaemia in 1-<5 Yrs. Children



Map 3

Prevalence (%) of Anaemia among 1-<5 year children

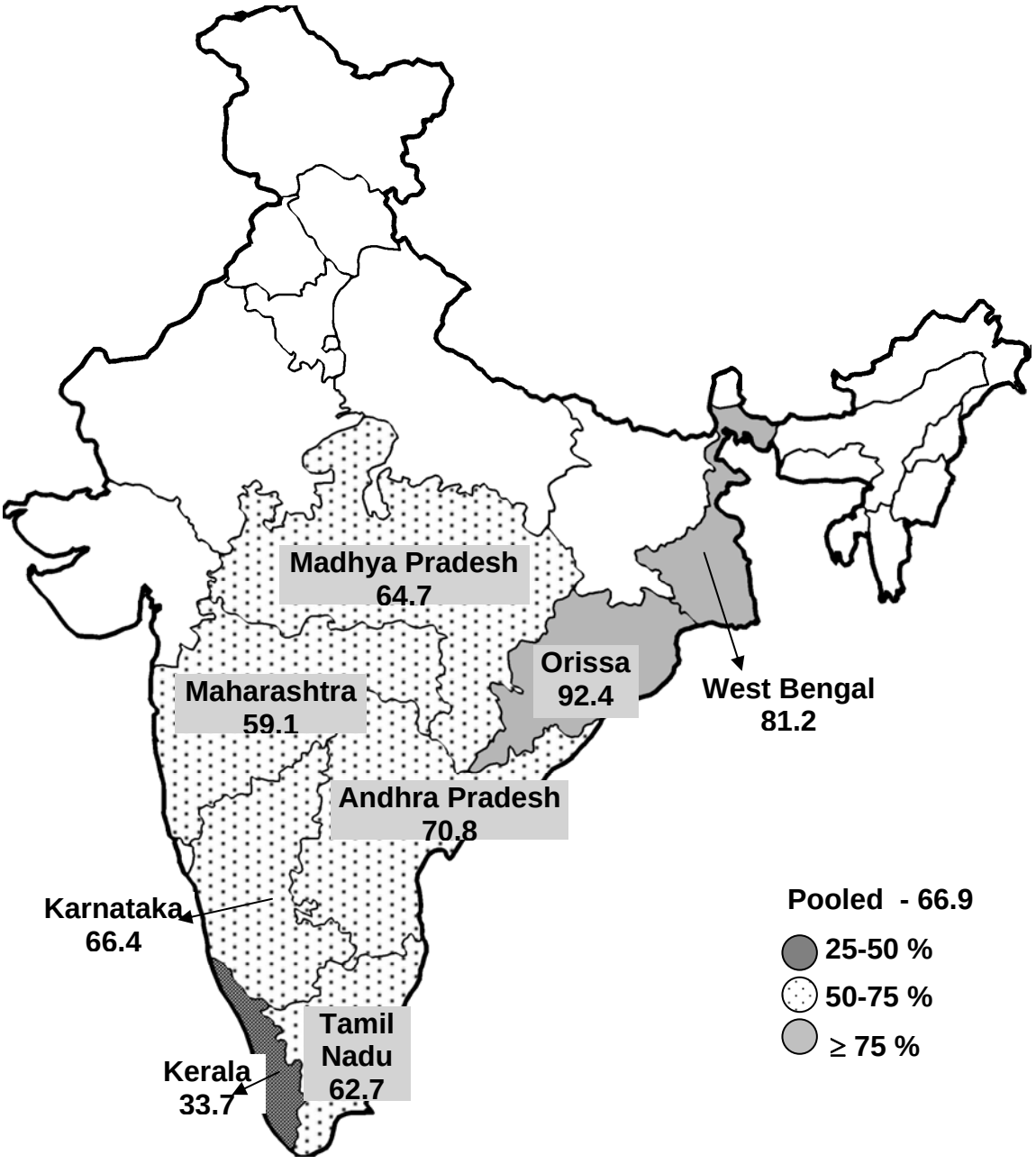


Fig. 10.1
Prevalence (%) of Anaemia in 12-14 Yrs. Adolescent Girls

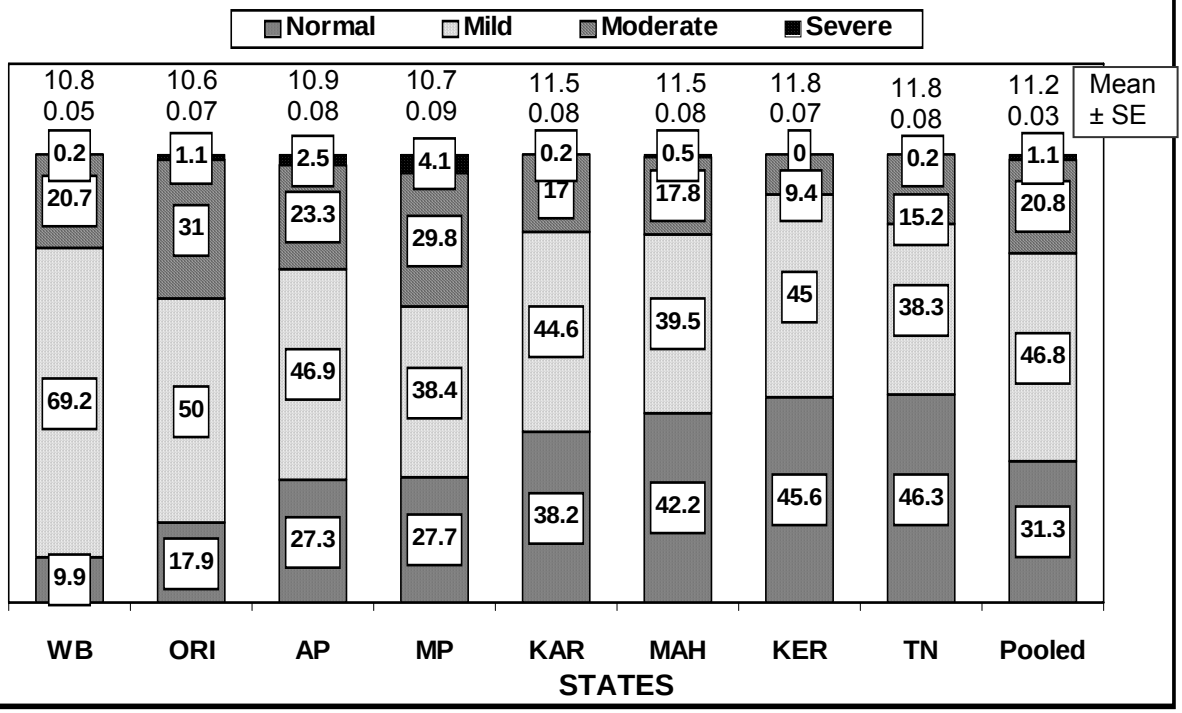
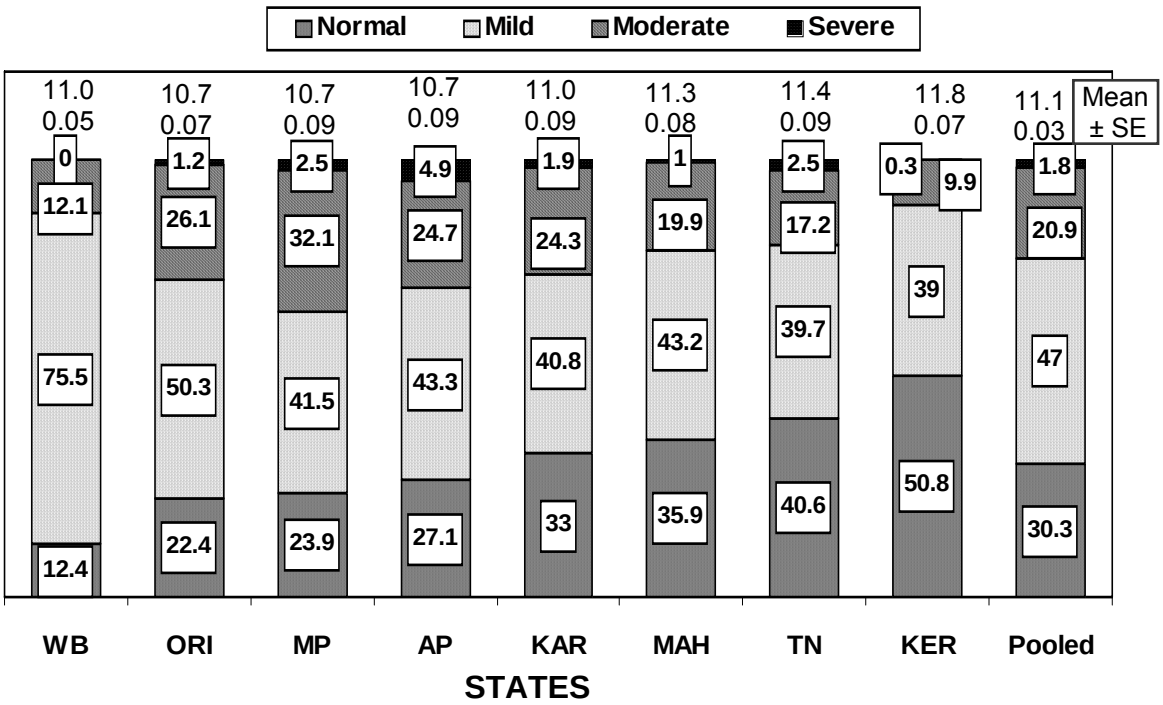
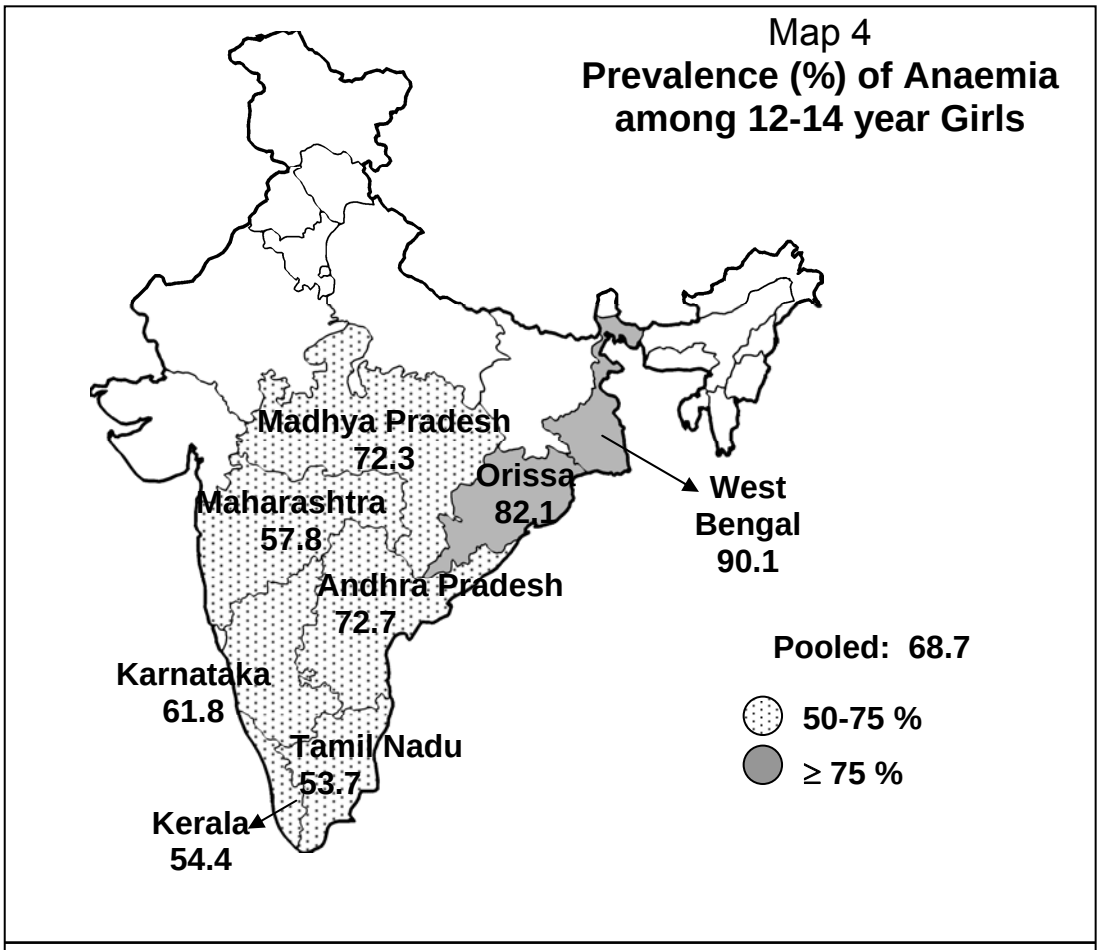
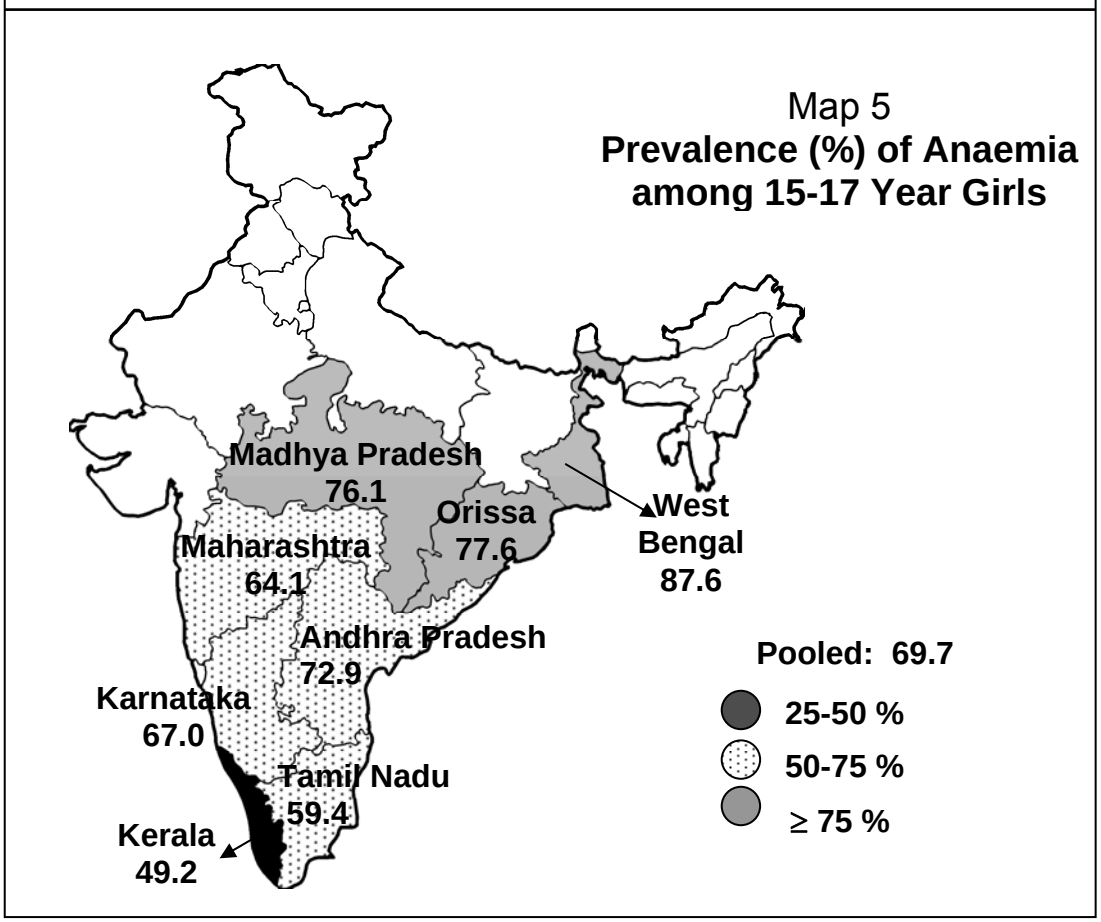


Fig. 10.2
Prevalence (%) of Anaemia in 15-17 Yrs. Adolescent Girls




Map 4
Prevalence (%) of Anaemia among 12-14 year Girls
Madhya Pradesh 72.3
Orissa 82.1
Maharashtra 57.8
West Bengal 90.1
Andhra Pradesh 72.7
Karnataka 61.8
Tamil Nadu 53.7
Kerala 54.4
Pooled: 68.7
50-75 %
≥ 75 %


Map 5
Prevalence (%) of Anaemia among 15-17 Year Girls
Madhya Pradesh 76.1
Orissa 77.6
Maharashtra 64.1
West Bengal 87.6
Andhra Pradesh 72.9
Karnataka 67.0
Tamil Nadu 59.4
Kerala 49.2
Pooled: 69.7
25-50 %
50-75 %
≥ 75 %

severe anaemia was about 4%. Among the States surveyed, the prevalence of anaemia among pregnant women was relatively higher in the States of Madhya Pradesh, Orissa and Karnataka (80-85%), followed by West Bengal, Maharashtra and Andhra Pradesh (70-77%) and Tamil Nadu (about 69%), with the least being in Kerala (50%) **(Table 15, Fig. 11 and Map 6)**.

4.5.1.4. Lactating women

The overall prevalence of anemia among lactating women was about 78% (CI: 76.7–79.5) while 32% had moderate anaemia and about 3% had severe anaemia. The prevalence of anaemia was relatively higher in the States of West Bengal (95.9%), Orissa (91.2%) and Madhya Pradesh (85.9%) compared to other States (55-76%) **(Table 16, Fig. 12 and Map 7)**.

4.6 KNOWLEDGE AND PRACTICES OF WOMEN ON VITAMIN A DEFICIENCY

Information regarding Knowledge and Practices on VAD among the mothers of index children was provided in **Tables 17.1-17.6**.

In general, about 41% of the mothers of index children interviewed were aware of night blindness. Their proportion ranged from a low 21-24% in the States of Madhya Pradesh and West Bengal to a high 57-63% in the States of Andhra Pradesh and Maharashtra. Other manifestations of Vitamin A deficiency, as perceived by the respondents were permanent blindness (8%), Bitot spots (3.8%), scar in the eye (1%) etc. About 12% and 14% of the mothers attributed these manifestations to vitamin A deficiency and dietary inadequacy, respectively. The awareness about causes of night blindness was relatively better among women in the State of Tamil Nadu.

About a third of the women (32%) stated that they would consult a doctor in case of VAD, while about seven percent said that they would get massive dose of vitamin 'A' administered to the child. While about 3% said that they would use household remedies, none mentioned about consumption of pro-vitamin A rich foods. However, when asked about the role of foods in the prevention of VAD, about 24% responded in affirmative and listed foods such as green leafy vegetables (18.4%), yellow coloured fruits (11.5%), animal foods (11.3%) and nutritious foods (9.3%), those have to be consumed to prevent VAD **(Table 17.1).**

4.6.1. Coverage under Massive Dose Vitamin A Programme

About 58% of the preschool children reportedly received at least one dose of massive vitamin A during the previous one year, while about 8% said that they were not aware of the same. The extent of coverage was maximum in the State of Orissa (80%) (possibly because of implementation of the special project of massive dose of

Fig. 11

Prevalence (%) of Anaemia in Pregnant women

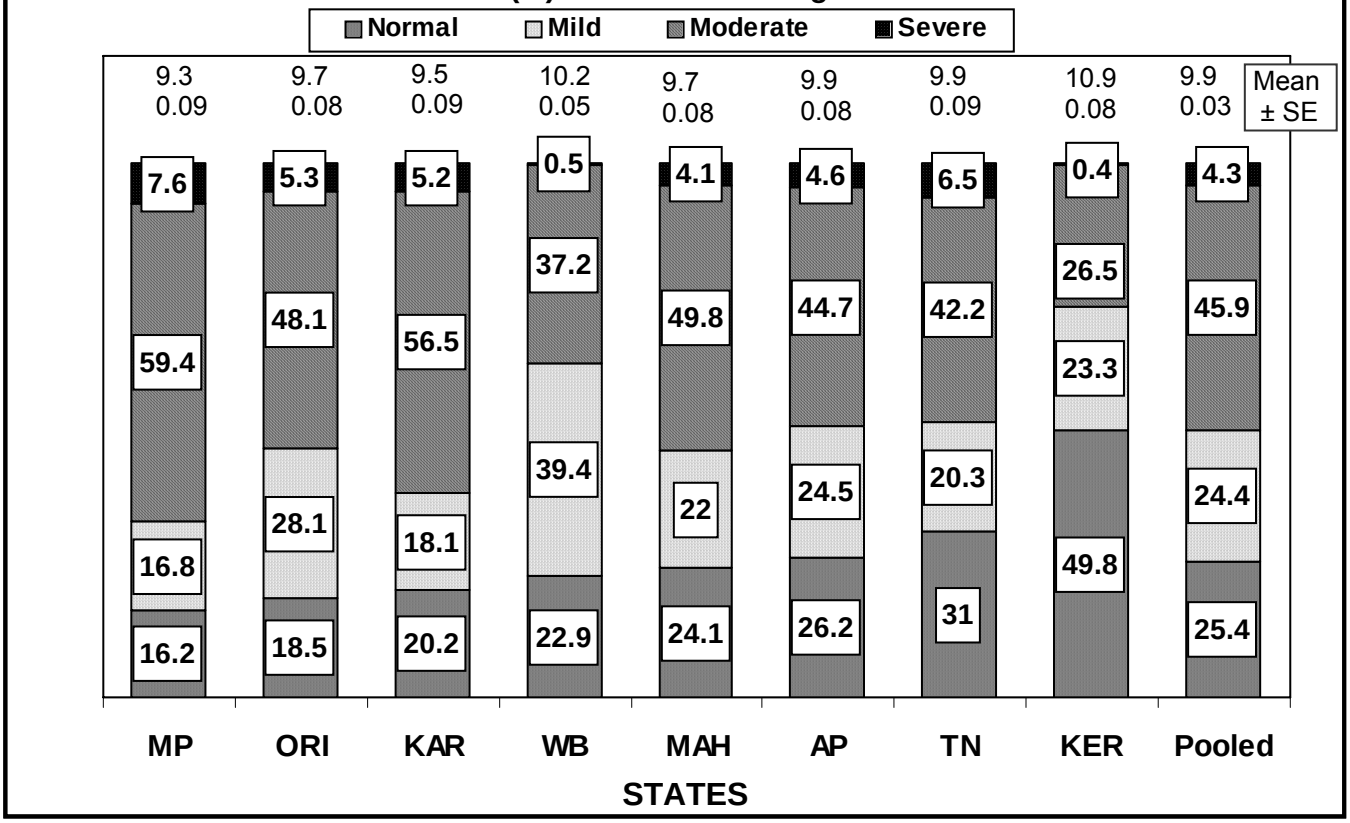
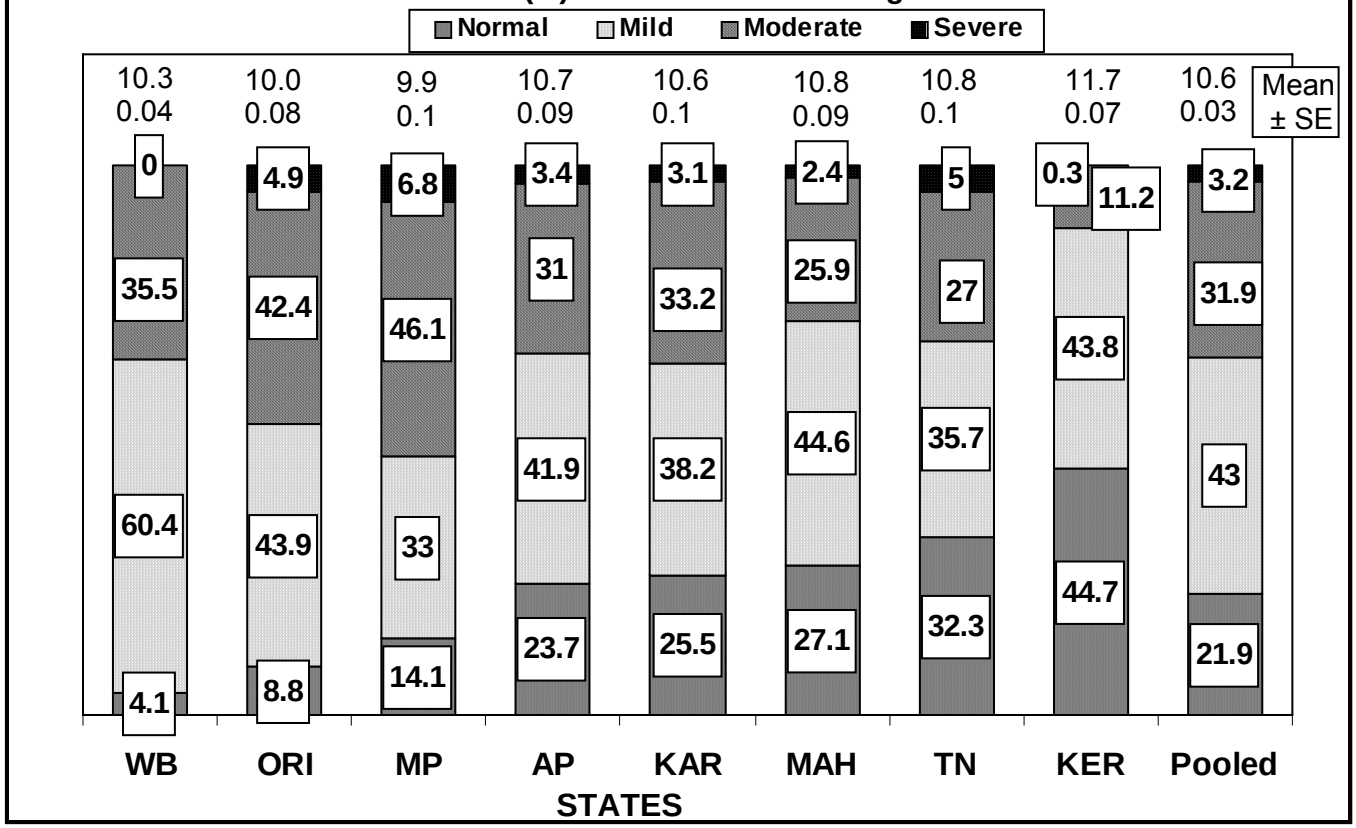
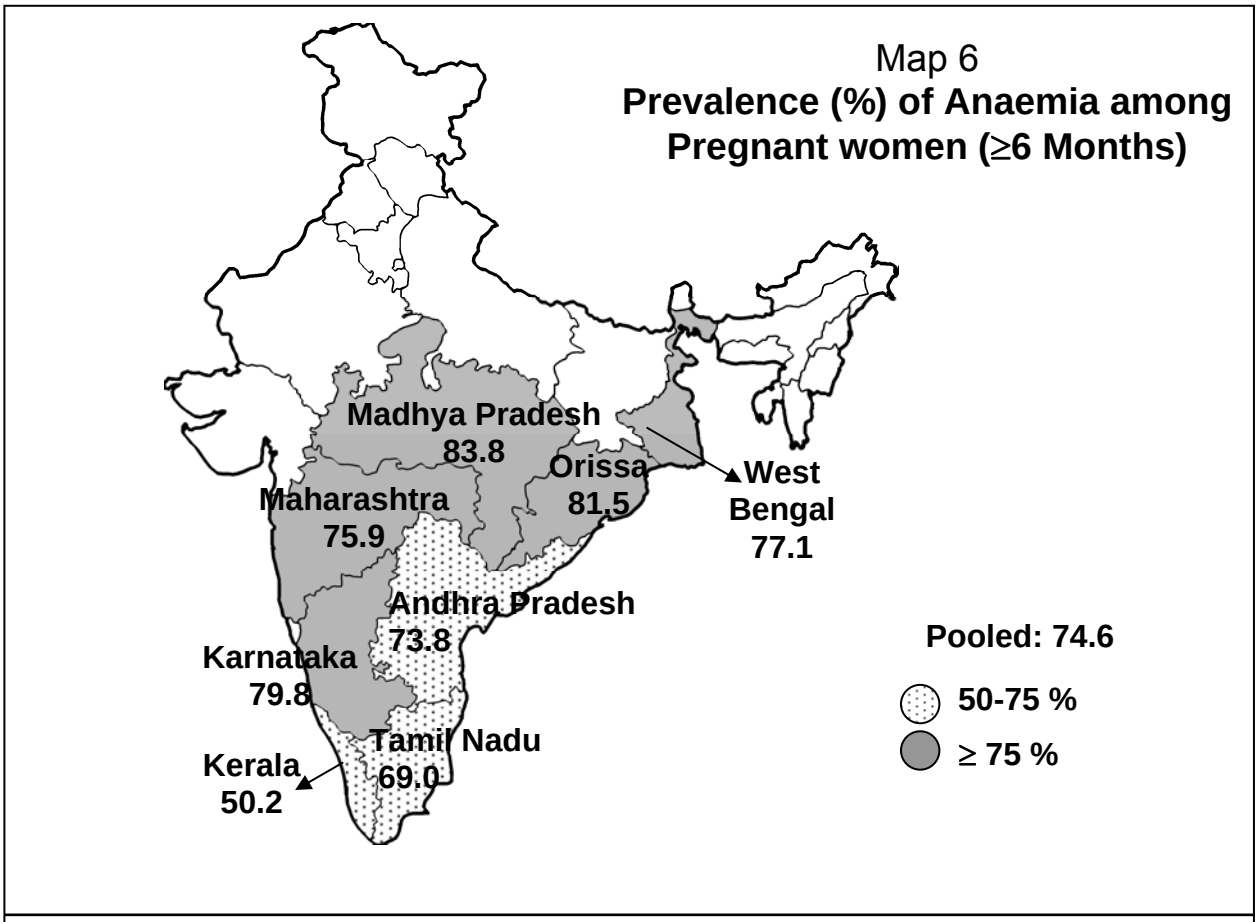
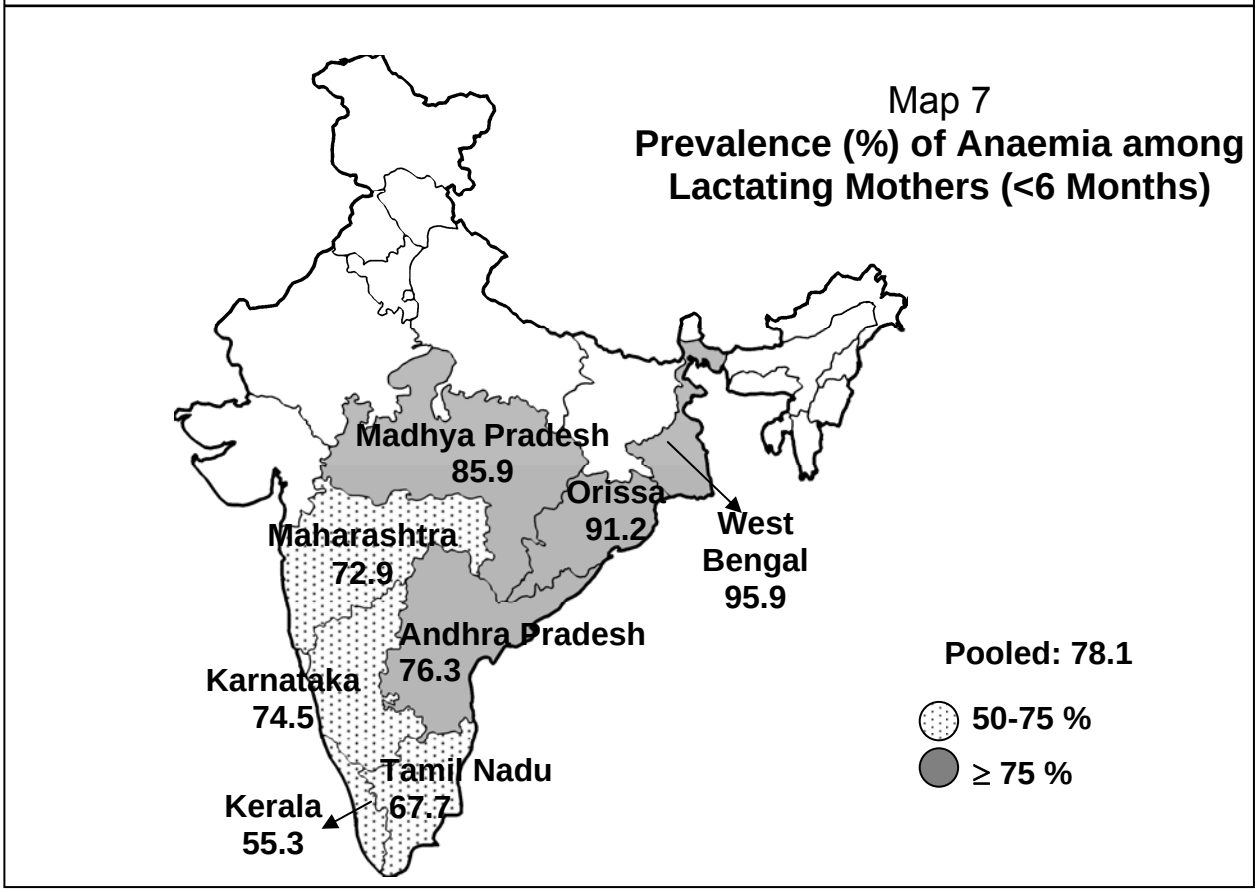


Fig. 12

Prevalence (%) of Anaemia in Lactating Mothers




Map 6
Prevalence (%) of Anaemia among Pregnant women (≥6 Months)
Madhya Pradesh 83.8
Orissa 81.5
West Bengal 77.1
Maharashtra 75.9
Andhra Pradesh 73.8
Karnataka 79.8
Tamil Nadu 69.0
Kerala 50.2
Pooled: 74.6
50-75 %
≥ 75 %


Map 7
Prevalence (%) of Anaemia among Lactating Mothers (<6 Months)
Madhya Pradesh 85.9
Orissa 91.2
West Bengal 95.9
Maharashtra 72.9
Andhra Pradesh 76.3
Karnataka 74.5
Tamil Nadu 67.7
Kerala 55.3
Pooled: 78.1
50-75 %
≥ 75 %

vitamin A supplementation along with polio immunization), followed by Tamil Nadu (63%), Karnataka (56.5%), the States of Andhra Pradesh, West Bengal, Maharashtra and Madhya Pradesh (51-53%), with the least being in Kerala (44%).

Only about 25% had reportedly received two doses, while about 30% had received one dose. Of these, about 36% had received the last dose during the previous 6 months and about 18% received during previous 6-11 months. Massive dose of Vitamin A was administered mostly by MPHW (F) (31.7%), followed by AWW (12%) and MPHS (F), either at AWC (24.7%) or at sub-centre (13.8%). **(Table 17.2)**. Of those who received massive dose vitamin A, a negligible proportion of children (about 1%) reportedly experienced side effects, mostly in the form of fever/ vomiting (0.3% each) or nausea (0.1%) **(Table 17.3)**.

The most common reasons cited by the mothers for the child not receiving the massive dose of vitamin A were, the same was not offered to their children (52%) or that they were not aware of it (34%) **(Table 17.4)**. About two third of the mothers whose children reportedly received massive dose of vitamin A during the previous one-year felt that it was beneficial for the child (60.6%). Of them, about 44% opined that it improved the general health of the child; about 22% felt that the eyes were healthy and about 10% reported that it prevented infections **(Table 17.5)**.

Only about 13% of the mothers reportedly had received nutrition education on VAD, and the messages included, the need for regular consumption of GLV (10%) and yellow coloured fruits (6.5%), the beneficial effects of vitamin A supplementation on 9-35 months children (5.7%), signs and symptoms of VAD (5.3%); and consequences of severe VAD (4.4%) **(Table 17.6)**.

4.7. KNOWLEDGE AND PRACTICES OF WOMEN ON IRON DEFICIENCY ANAEMIA

Information regarding knowledge and practices on IDA among the mothers of index children is provided in **Tables 18-23.** The information collected from the HHs of different physiological groups was pooled taking care to see that there was only one respondent from each of the selected HH.

In general, only about one a third of women (33.9%) were aware of anaemia. The proportion was relatively higher in the States of Andhra Pradesh (62.5%) and Tamil Nadu (50.6%) and was low in the States of Madhya Pradesh (8.5%) and Orissa (15.4%). About 23% of women stated ‘tiredness’ as one of the manifestations of anaemia, followed by paleness (16.7%) and breathlessness (5.3%). A higher proportion of women stated ‘tiredness’ as a symptom of anaemia in the States of Tamil Nadu (42.3%), and Andhra Pradesh (40.4%), followed by Maharashtra (30.8%), Karnataka (28%) and Kerala (23.6%).

About one fourth (25.8%) of the women stated dietary inadequacy as one of the cause of anemia, while a few women attributed it to blood loss (4.5%) or iron deficiency (3.7%). About 30% of the women said that they would consult a doctor in case of anaemia, while about 3-4% each said they would prefer to consume iron folic acid tablets or use household remedies **(Table 18).**

4.7.1 Coverage for Iron and Folic Acid (IFA) Tablets Distribution

The particulars of coverage of different categories of beneficiaries for the distribution of IFA tablets are provided in **Tables 19.1- 22**. While the extent of coverage was in general very low among pre-school children (3.8%) and lactating mothers (12.3%), a relatively higher proportion of pregnant women reportedly received the IFA tablets (62.2%).

The proportion of pregnant women who reportedly received iron & folic acid tablets ranged from a high 70-80% in the States Maharashtra (77.6%), Orissa (72.9%), West Bengal (70.6%), through 62-67% in the States of Karnataka (67.2%) and Tamil Nadu (62.4), about 50% in the States of Madhya Pradesh (51.2%) and Andhra Pradesh (48.5), to a low 38.2% in the State of Kerala. The IFA tablets were distributed mostly by MPHW (F) in case of pregnant (37.6%) and lactating women (7.4%), while in case of children it was either by AWW (1.7%) or MPHW (F) (1.8%), either at sub-centre, home or AWC **(Tables – 19.1, 20.1 and 21.1).**

Of those who had received IFA tablets, the proportion who reportedly received ≥ 90 tablets was very low and ranged from a low of 2% among preschool children to 30% among pregnant women. The proportion of pregnant women who reportedly received ≥ 90 tablets was relatively higher in the States of Orissa (50.9%) and Karnataka (39.5%) **(Tables – 19.2, 20.2 and 21.2)**. About 9% pregnant women, 4% lactating women and 0.3% of preschool children reportedly experienced side effects on consumption of IFA tablets, mostly in the form of vomiting (0.2 – 4.1%), nausea (0.1–5%) or black stools (0.1–1.2%) **(Tables – 19.3, 20.3 and 21.3)**.

The most common reason for partial or non-receipt of IFA tablets in the case of pregnant women, lactating women and children was that the tablets were 'not offered' (52.5%) **(Table 22),** that were not aware of (18%) or that they preferred to consult a private doctor (12.4%). Only about 14% of the women reportedly received nutrition education regarding IDA and the messages included and symptoms of anaemia (7.3%), regular consumption of iron rich foods (7.5%) and consumption of iron folic acid tablets (5.4%) from either the health functionaries or *Anganwadi* workers.

The proportion of women who received nutrition education was relatively higher in the States of Tamil Nadu (26.1%) and Andhra Pradesh (about 25%); while

it was low in the States of West Bengal (0.6%), Kerala (1.8%), Madhya Pradesh (4.9%) and Orissa (6.4%) **(Table 23).**

4.8. MICRONUTRIENT DEFICIENCIES VS SOCIO-ECONOMIC VARIABLES

4.8.1. Vitamin A Deficiency

The prevalence of vitamin A deficiency among 1-<5 year children according to the socio-economic variables is given in the **Table 24**.

4.8.1.1. Religion

The prevalence of Bitot spots was significantly ($p<0.05$) higher among Hindus (0.8%) compared to Muslims (0.3%) and Christians (0.2%). Similarly, the prevalence of conjunctival xerosis was significantly higher among Hindus (1.8%) compared to Christians (0.2%).

4.8.1.2. Community

The prevalence of Bitot spots was significantly higher among children belonging to Scheduled Caste (1.4%) and Scheduled Tribe (1.2%) communities, than those of backward castes (0.6%) and other communities (0.4%) **(Fig. 13)**.

4.8.1.3. Occupation

The prevalence of Bitot spots was significantly higher among children belonging to households engaged in labour activities, compared to those in other occupations **(Fig. 14)**.

4.8.1.4 Family size

The proportion of Bitot spots was higher (1%) among the households with larger family size (5-7) as compared to those with a family size of ≤ 4 (0.6%) **(Fig. 15)**.

4.8.1.5. Adult female literacy

The prevalence of Bitot spots was significantly higher (1.1%) in the HHs with an illiterate adult female than those with literate (0.4%) **(Fig. 16)**.

4.8.1.6. Sanitary Latrine

The prevalence of vitamin A deficiency (Bitot spots) was significantly lower in the HHs having sanitary latrine (0.2%), compared to those who did not (0.9%) **(Fig. 17)**.

4.8.2. Iron Deficiency Anaemia

The prevalence of anaemia in different age/sex/physiological groups by the socio-economic variables is given in the **Tables 25.1 & 25.2.**

4.8.2.1. Religion

The prevalence of anaemia among preschool children, adolescent girls, pregnant women and lactating mothers was relatively higher among those belonging to Hindu and Muslim religions, compared to Christians.

Fig.13 **Prevalence (%) of Bitot Spots in 1-<5 Yrs. Children by Community**

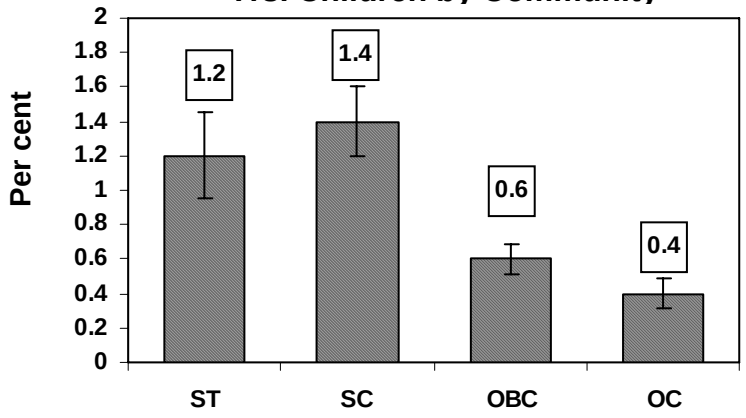


Fig.14 **Prevalence (%) of Bitot Spots in 1-<5 Yrs. Children by Occupation**

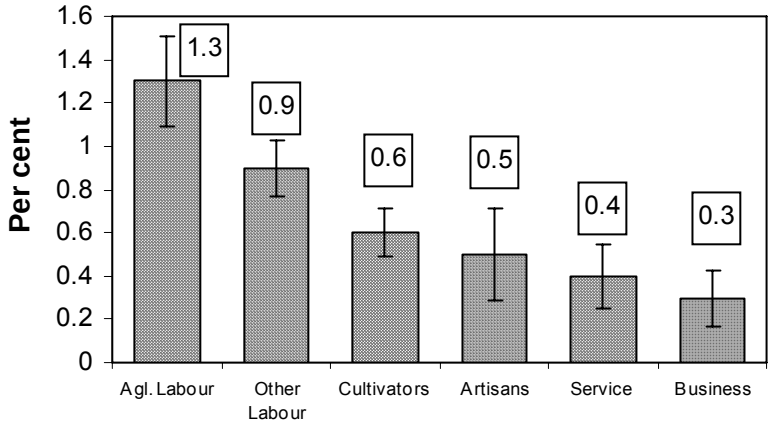


Fig. 15 **Prevalence (%) of Bitot Spots in 1-<5 Yrs. Children by Family Size**

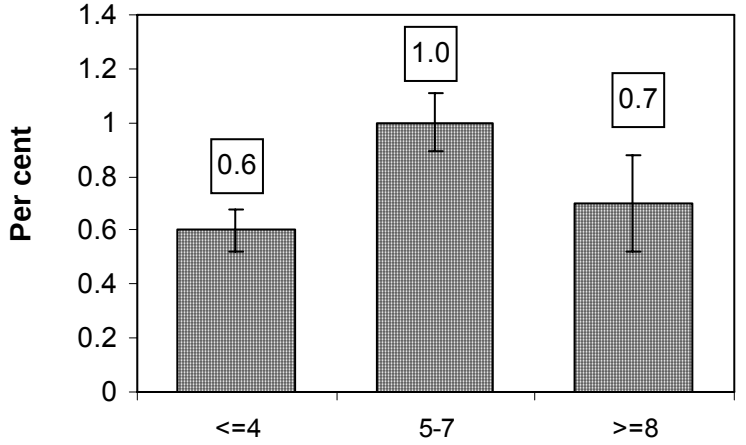


Fig.16 **Prevalence (%) of Bitot Spots in 1- <5 Yrs. Children by Adult Female literacy status**

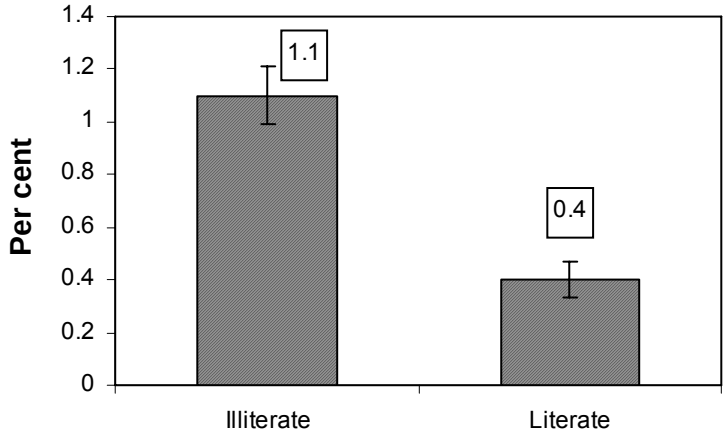


Fig. 17

Prevalence (%) of Bitot Spots in 1-<5 Yrs. Children by Sanitary Latrine

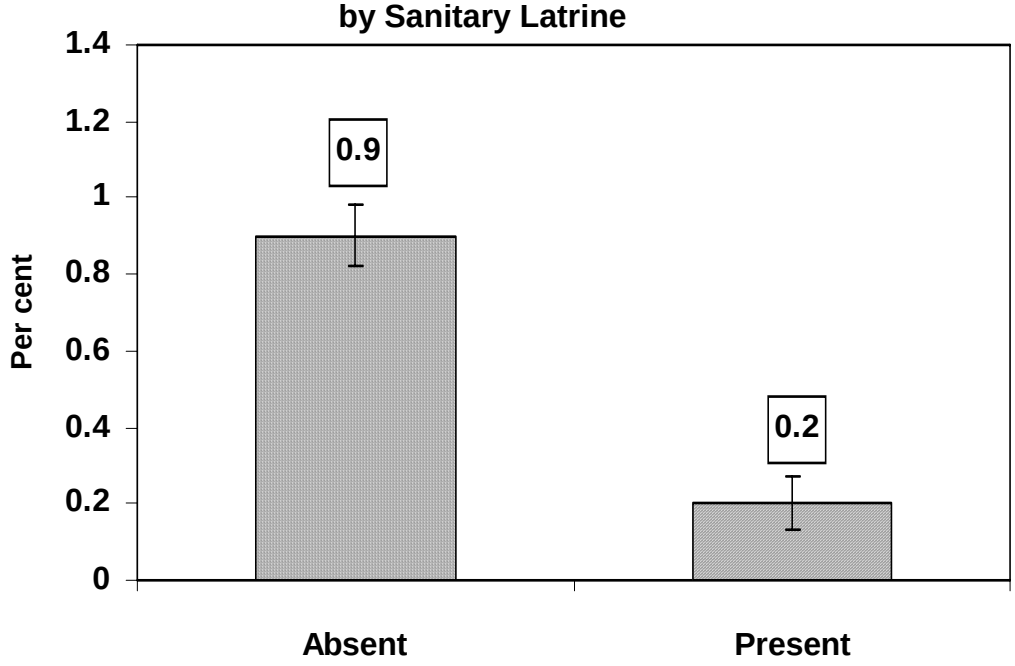
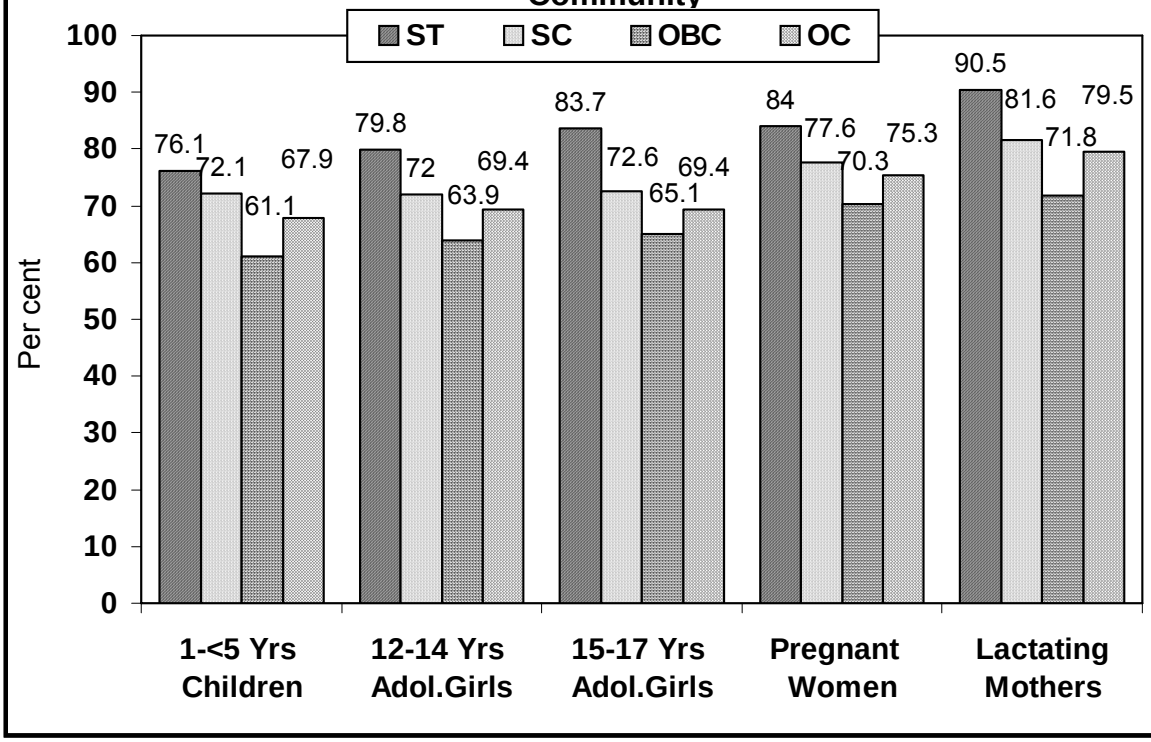


Fig 18

Prevalence (%) of Anaemia in different physiological groups by Community



4.8.2.2. Community

The overall prevalence of iron deficiency anaemia was significantly higher among preschool children (72-76%), younger adolescent girls (72-80%), older adolescents (73-84%), pregnant women (78-84%) and lactating women (82 to 96%) belonging to SC/ST household compared to the rest **(Fig. 18).**

4.8.2.3. Occupation

In general, the prevalence of overall anaemia was essentially similar among 1-5 year children and adolescent girls belonging to households engaged in different occupations. However, the prevalence was relatively higher among pregnant and lactating women from households engaged in agriculture or agricultural labour, compared to others.

4.8.2.4. Family size

The prevalence of anaemia was found to be significantly higher among preschool children, younger adolescents (12-14 years) and lactating women with a family size of ≤4, compared to those with family size of ≥8.

4.8.2.5. Adult female literacy

The prevalence of anaemia was significantly higher among preschool children (71.3%), adolescent girls (71-72%), pregnant women (78.7%) and lactating women (83.6%) in the HHs with illiterate adult female, compared to those with literate adult female **(Fig. 19).**

4.8.2.6. Sanitary Latrine

The prevalence of anaemia was significantly higher among preschool children (71%), adolescent girls (71-72%), pregnant women (77.5%) and lactating women (81.8%) from the HHs having no sanitary latrines, compared to those having the same (52-66%) **(Fig. 20).**

4.8.3. Iodine Deficiency Disorders and the extent of use of Iodised salt

The prevalence of total goitre among school age (6-<12 year) children and percent of households using adequately iodised salt (iodine content ≥15 ppm) according to the socio-economic variables is given in the **Table 26**.

4.8.3.1. Religion

The prevalence of total goitre was significantly low among Christians (0.5%) as compared to other religions (2 - 4%) **(Fig. 21).** The proportion of HHs using salt having adequate iodine (≥15 ppm) was significantly higher among Muslim and Christian HHs (about 40%) as compared to Hindu (about 30%) or other (23%) religions.

Fig 19
Prevalence (%) of Anaemia in different physiological groups by Adult Female Literacy Status

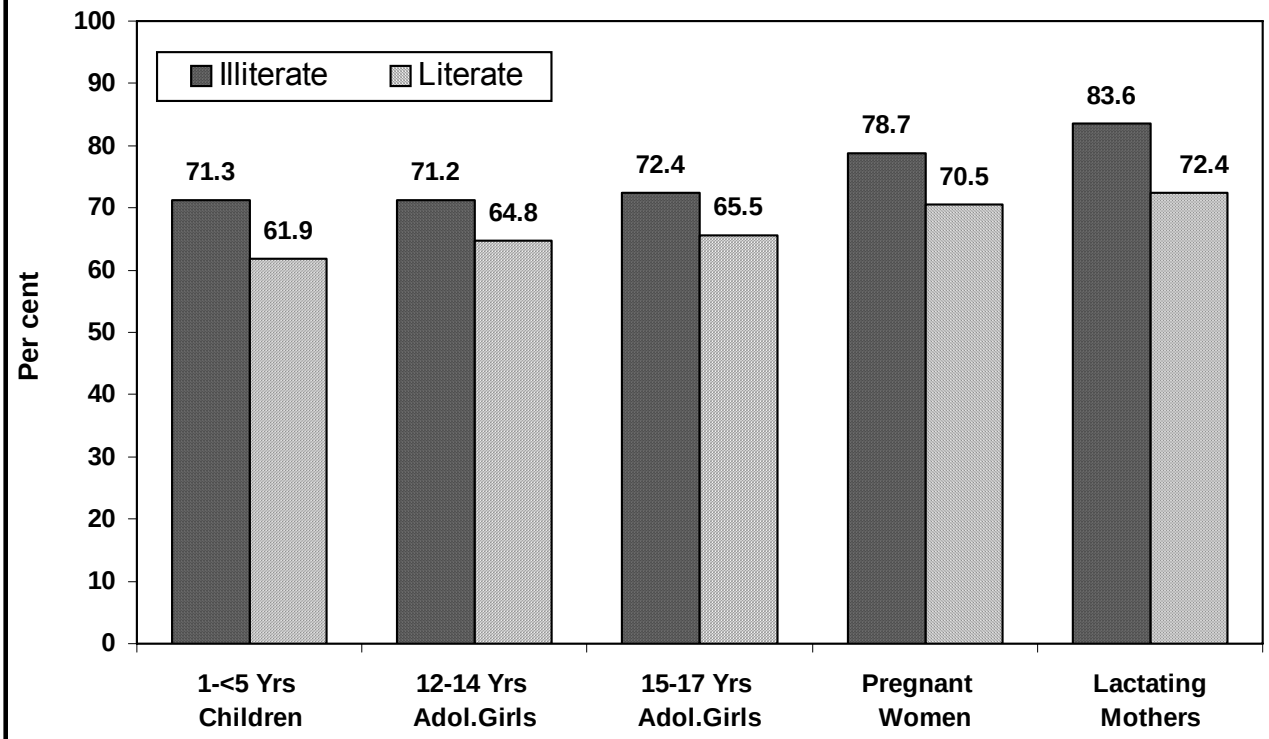
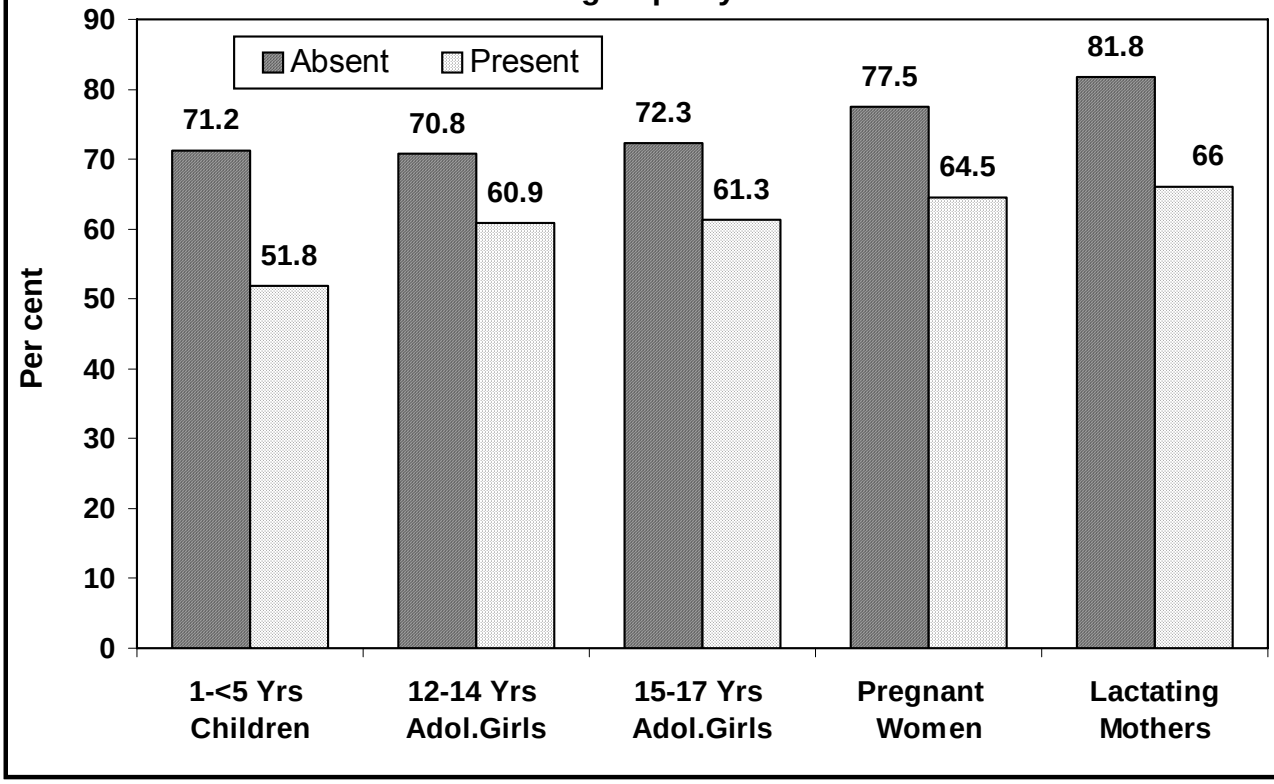


Fig 20
Prevalence (%) of Anaemia in different physiological groups by



4.8.3.2. Community

The prevalence of goitre was relatively low among those from OBC communities (2.5%), compared to Schedule Tribe (5.7%), Schedule Caste (4.8%) or other (4.5%) communities **(Fig. 22)**. The extent of use of adequately iodised salt was least in the Schedule tribe (19%) HHs followed by Scheduled castes (27%), Backward (30%) and other communities (41%).

4.8.3.3. Occupation

The prevalence of goitre ranged from a minimum 2.4% among HHs engaged in 'Other' occupations, to a maximum 4.9% among agricultural labourers and did not reflect any clear-cut trends. The extent of use of iodized salt however, was significantly higher among service/business HHs (47%), as compared to other occupations (23-33%).

4.8.3.4. Family size

The prevalence of total goitre was essentially similar among households with varying family size **(Fig. 23)**. A higher proportion of HHs (37%) with family size of ≤ 4 were found consuming adequately iodized salt compared to those with family size of ≥ 8 (23%).

4.8.3.5. Adult female literacy

The prevalence of goitre was relatively higher (4.1%) among HHs where the adult female was illiterate, compared to those with literate (3.4%) **(Fig.24).** A significantly higher proportion of HHs having literate adult female (40.4%) was consuming adequately iodized salt, compared to those having an illiterate adult female (23%).

4.8.3.6. Sanitary Latrine

The prevalence of goiter was significantly higher in the HHs not having sanitary latrine (4.3%) compared to those who have the same (2.3%)**.** Similarly, the extent of use of iodised salt was significantly higher among the HHs having sanitary latrine (51%) as compared to those not having (25%), The possession of a sanitary latrine, perhaps, may reflect better economic status thereby indicating better use of iodised salt and low prevalence of goitre.

4.8.4. Association of Socio-economic and Demographic Variables with the Prevalence of Micronutrient Deficiencies – Multivariate Analysis

To identify the best sets of socioeconomic and demographic variables that were related to micro-nutrient deficiencies such as prevalence of Bitot spots, anaemia in various sex, age and physiological groups, goiter among 6-12 year children, multivariate logistic regression analysis was carried out. The independent

Fig 21 Prevalence (%) of Total Goitre in 6 - <12 Yrs Children by Religion

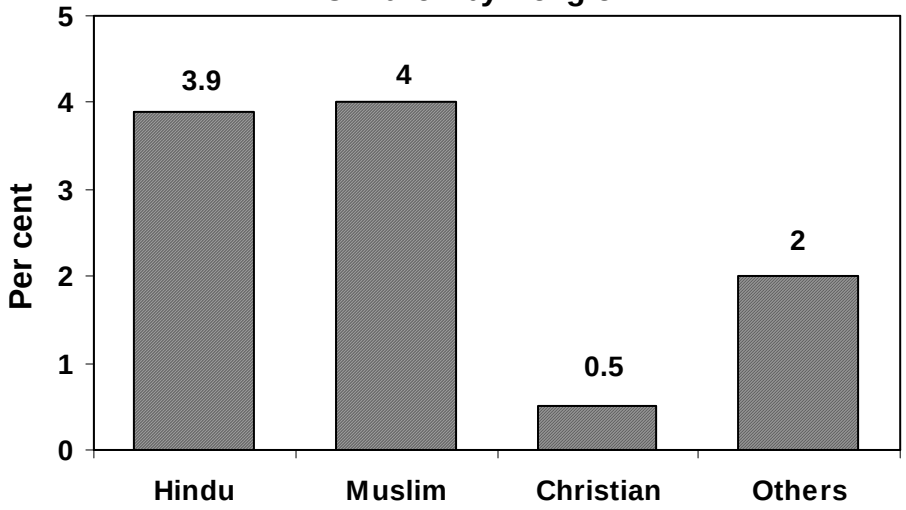


Fig 22 Prevalence (%) of Total Goitre in 6 - <12 Yrs Children by Community

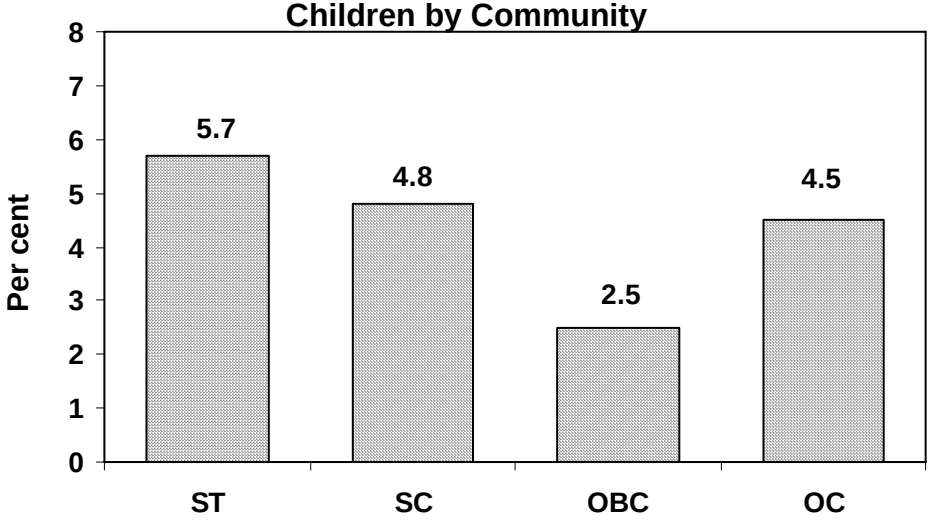


Fig 23 Prevalence (%) of Total Goitre in 6 - <12 Yrs Children by Family Size

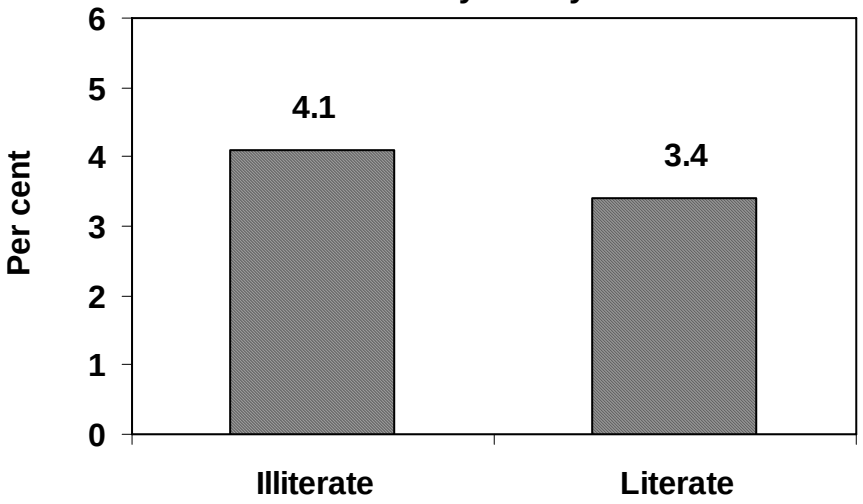
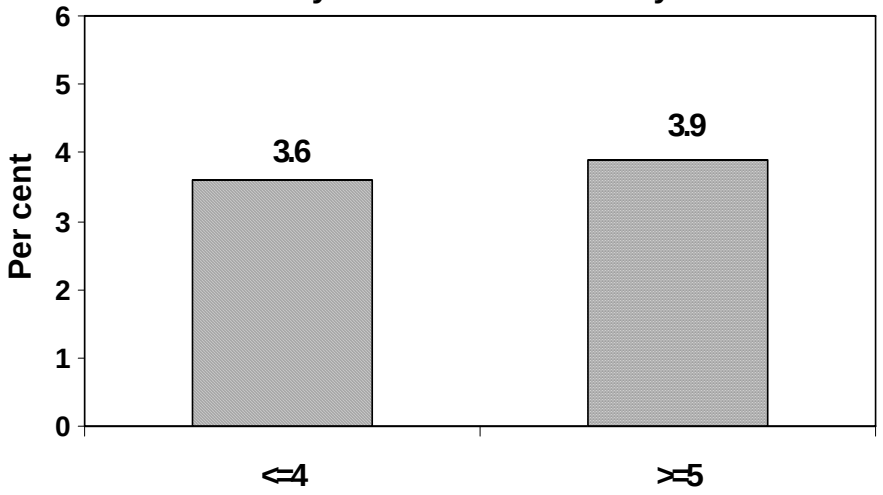


Fig 24 Prevalence (%) of Total Goitre in 6 - <12 Yrs Children by Adult Female Literacy Status



variables such as religion (Christian), community (forward community), occupation of head of the HH (business/service), family size (≥ 4), Adult female literacy (literate), sanitary latrine (presence) at HH level were included in the model. The variables in the parenthesis indicate reference category. Similarly, the dependent variables were categorized in to bi-variate groups viz., 'absent' or 'present'.

The analysis revealed that the risk of developing Bitot spots was twice in the children of SC/ST communities as compared to the children of other communities. Similarly, the children from HHs which did not have sanitary latrine had three times greater risk as compared to the presence of sanitary latrine **(Table 27)**.

The risk of having goiter was seven times higher among children belonging to Muslim and six times higher among Hindu communities, compared to Christians. Similarly, the children from the HHs with out sanitary latrine, had higher risk (OR=1.76) than those with sanitary latrine.

The risk of developing anaemia was two folds higher among the preschool children belonging to Hindu and Muslim religion compared to Christians and those from HHs not having sanitary latrine. Similar observations were made in case of the other age, sex and physiological groups.

Step-wise logistic regression was also carried out between indicators of nutritional status such as height for age (< or ≥ 2SD), intake of nutrients such as energy, protein, calcium, iron and vitamin A (< or ≥70% RDA) as assessed during diet & nutrition surveys carried out in the same villages during 2000-01, and receipt of massive dose of vitamin A, with the prevalence of anaemia (normal and anaemia) and Bitot spots among preschool children as assessed during the current survey.

Prevalence of anaemia and underweight were positively associated, while the prevalence of Bitot spots and receipt of number of doses of massive vitamin A were inversely associated.

5. COMMENTS

In the recent years, deficiency of micronutrients, which play a crucial role in a host of physiological, biological and immunological functions of the body, has been recognized as an important nutritional problem. The present survey, perhaps for the first time in the country, was carried out among rural population of eight major States in the country, covering statistically adequate sample size.

Though the prevalence of severe forms of vitamin A deficiency such as corneal ulcers/ keratomalacia has in general become rare, the milder forms such as Bitot spots were present in varying magnitudes in different parts of the country. The overall

prevalence of Bitot spots (0.8%) among preschool children was similar to that observed in the NNMB surveys (NNMB Repeat survey 1999[9]and NNMB Rural survey 2002[5]). District level micronutrients survey carried out by ICMR[7]also revealed similar prevalence **(Fig 7)**. The prevalence was higher than the WHO cut-off level of 0.5%, indicating the public health significance of the problem of VAD. It is also important to note that, while the prevalence of Bitot spots was above WHO cut-off level in six States, while in the State of Kerala it was nil and in Orissa it was less than 0.5%. The lower prevalence in Orissa, perhaps, could be attributed to large coverage of children for the supplementation of massive dose vitamin A, by campaign approach during the previous years.

The overall prevalence of total goitre among 6-<12 year children was about 4%, which is below the cut-off level of 10% recommended by the Government of India, as well as the WHO cut-off level of 5%, indicative of IDD endemicity. The findings are comparable with the recent study conducted by ICMR in the year 2002 (4.8%) **(Fig. 25)**. The prevalence was found to be more than the cut-off level of 5% in the States of Maharashtra (11.9%) and West Bengal (9%). The current figures are much lower than the figures of 21% of goiter and 0.7% of cretinism reported in ICMR's multicentric study carried out during 1984-86[10]. It may be mentioned here that the current estimates are at the State level and hence do not rule out the possibility of existence of endemic districts with in a given State.

In the present study, the overall prevalence of anaemia as per the WHO criteria, among various target groups studied, ranged from 67% in preschool children to 78% in the lactating women. The prevalence of anaemia among pregnant women observed in the present study was lower (75%) than the figures reported in the ICMR[9] study (84.9%) but was higher than that of NFHS-II[11] (52%) **(Fig. 26)**. The prevalence of vitamin A deficiency (Bitot spots) and anaemia were relatively higher in the HHs belonging to SC/ST communities, agricultural and other labour, those with illiterate adult female and with out sanitary latrine.

Evaluations of National Nutrition programmes in the country carried out in the past have revealed their failure in achieving the set objectives[12]. In the present study, the proportion of children who reportedly received two doses of vitamin A during previous one year was about 25%. The proportion of pregnant women who had received $\geq$ 90 tablets reportedly was very small (30%). Less than a third of the HHs (30.7%), were found consuming adequately iodized salt (iodine content ≥15 ppm), as against the figure of 55.5% reported in ICMR study **(Fig.27)**. More importantly, in about 42% of the HHs, the salt samples did not have any iodine at all. These results, thus, indicate poor outreach of the programmes due to unsatisfactory implementation.

Fig. 25

Prevalence (%) of goitre in 6-<12 years children by Type of Survey

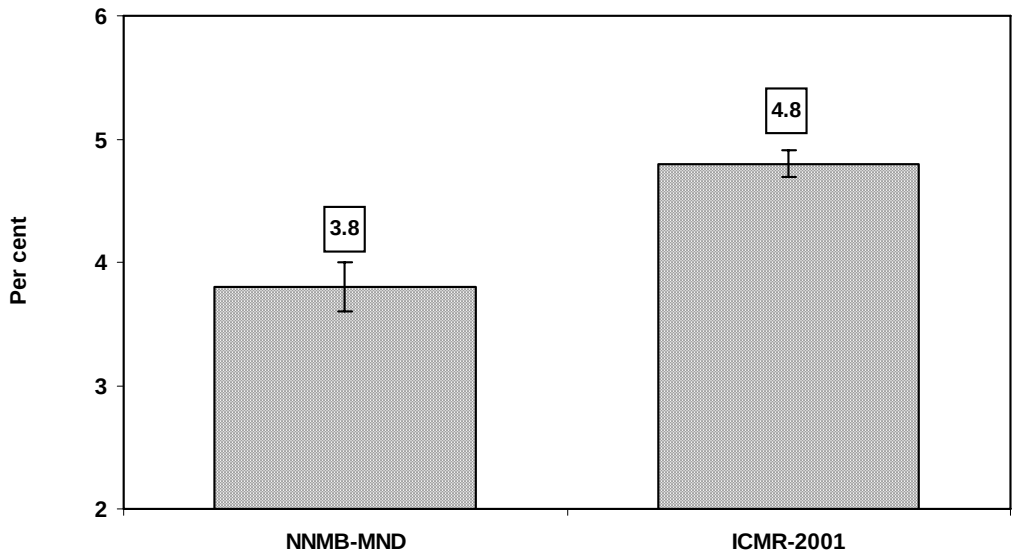


Fig. 26

Prevalence (%) of Anaemia in Pregnant women and Adolescent girls by Type of Survey

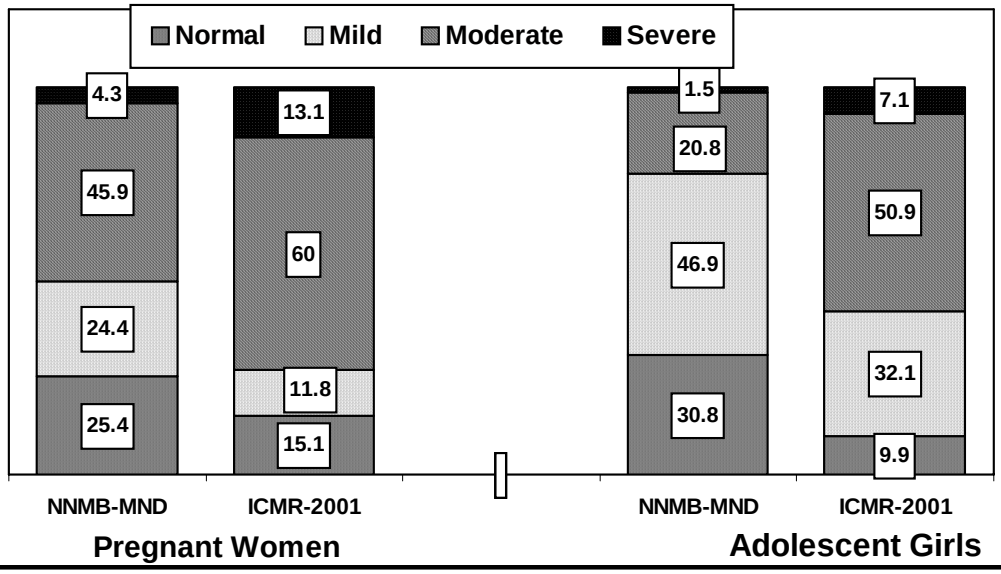
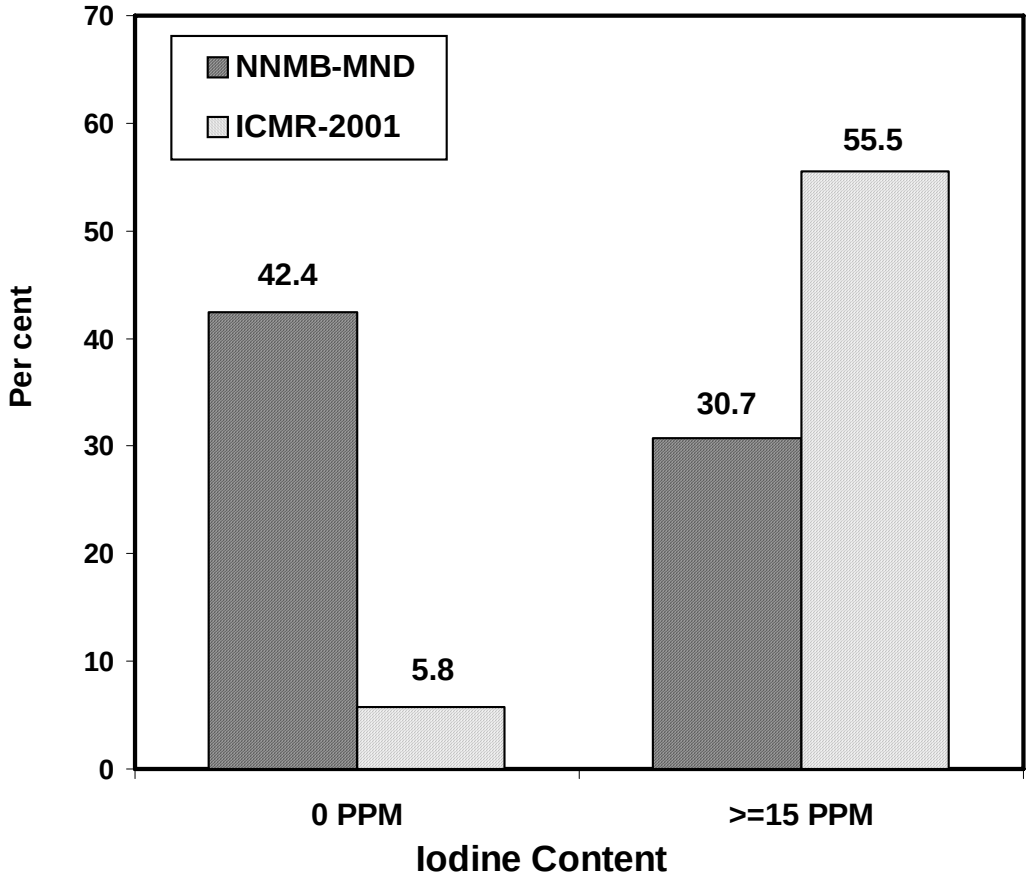


Fig. 27

Distribution (%) of HHs by Iodine content (>=15 PPM) in Salt by Type of Survey



Nutrition education is considered to be a major component of all the national nutrition programmes. The present study revealed that the nutrition education component was unsatisfactory, covering a mere 14% of the target beneficiaries. These results point out that there is an urgent need for improving the implementation of the national nutrition programmes and strengthening of nutrition education component.

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TABLES

Table 1.1

Distribution (%) of observations according to Intra-individual variation in Haemoglobinometry

States	N	Difference in the OD value between the duplicate samples.			
		0.0	**0.01**	**0.02**	**> 0.02**
Kerala	90	62.2	35.6	2.2	0.0
Tamil Nadu	145	56.6	43.4	0.0	0.0
Karnataka	139	84.9	11.5	0.7	2.9
Andhra Pradesh	185	58.4	38.4	0.5	2.7
Maharashtra	116	34.5	61.2	3.4	0.9
Madhya Pradesh	189	65.1	31.2	3.2	0.5
Orissa	112	43.8	55.3	0.9	0.0
West Bengal	124	56.5	41.9	1.6	0.0
Pooled	***1100***	***58.8***	***38.7***	***1.5***	***1.0***

Table 1.2

Distribution (%) of the observations according to Intra-individual variation in Haemoglobinometry

States	N	Difference in the Hb value (g/dl) between the duplicate samples.				
		≤ 0.5	**0.51-1.00**	**1.01-1.50**	**1.51- 2.00**	**≥ 2.01**
Kerala	90	96.7	3.3	0.0	0.0	0.0
Tamil Nadu	145	99.3	0.7	0.0	0.0	0.0
Karnataka	139	95.7	0.7	1.4	0.0	2.2
Andhra Pradesh	185	95.1	2.2	1.1	0.5	1.1
Maharashtra	116	95.7	3.4	0.0	0.0	0.9
Madhya Pradesh	189	95.8	3.7	0.5	0.0	0.0
Orissa	112	97.3	2.7	0.0	0.0	0.0
West Bengal	124	98.4	1.6	0.0	0.0	0.0
Pooled	***1100***	***96.6***	***2.3***	***0.5***	***0.1***	***0.5***

Table 2

Particulars of coverage

States	No. of Villages	No. of House-holds	Individuals							Households		
			Clinical		Haemoglobin					K & P		Spot test for Iodine in salt
			VAD (1-<5Yrs.)	IDD (6-<12Yrs.)	Pre- school (1-<5Yrs.)	Adolescent Girls		Preg. Women (≥24 wks)	Lact. Women (<6 mths)	IDA	VAD	
						12-14 Yrs.	15-17 Yrs.					
Kerala	80	10263	8329	3601	369	342	364	279	338	436	148	559
Tamil Nadu	80	10627	9197	3888	407	407	406	384	400	709	322	658
Karnataka	80	8778	8627	3436	425	424	424	386	392	926	359	621
A.P.	80	10545	9327	3622	448	443	446	416	439	1022	402	720
Maharashtra	78	9024	8646	3482	404	415	418	386	410	908	309	698
M.P.	75	7576	8777	3343	394	393	393	340	382	843	340	601
Orissa	80	8948	9460	3575	407	436	433	356	408	915	410	665
West Bengal	80	9839	9228	3490	437	435	437	436	437	685	391	687
Pooled	***633***	***75600***	***71591***	***28437***	***3291***	***3295***	***3321***	***2983***	***3206***	***6444***	***2681***	***5209***
Target	**640**	**-**	**76064**	**27656**	**2668**	**2688**	**2688**	**2688**	**2688**	**-**	**-**	**-**

Table 3

Distribution (%) of Households by religion

States	n	Religion			
		Hindu	Muslim	Christian	Others
Kerala	10263	55.6	28.6	15.8	0.0
Tamilnadu	10627	89.4	2.0	8.6	0.0
Karnataka	8778	91.3	7.0	0.9	0.8
Andhra Pradesh	10545	95.8	4.1	0.1	0.0
Maharashtra	9024	88.3	9.7	0.1	1.9
Madhya Pradesh	7576	95.7	2.7	0.7	0.9
Orissa	8948	95.4	3.6	1.0	0.0
West Bengal	9839	78.3	20.5	1.1	0.1
Pooled	***75600***	***85.7***	***10.1***	***3.8***	***0.4***

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Table 4

Distribution (%) of Households by Major Occupation of head of HH

States	n	Occupation of the Head of the HH						
		Agri. Labo-urers	Other Labo-urers	Cultiv-ators	Artisans	Service	Busi-ness	Others
Kerala	10263	4.5	42.1	2.4	7.3	18.5	20.5	4.7
Tamilnadu	10627	20.7	38.4	20.8	8.3	5.7	5.0	1.1
Karnataka	8778	19.4	12.6	42.1	7.3	9.3	8.8	0.5
Andhra Pradesh	10545	33.2	22.4	25.2	6.3	5.6	5.0	2.3
Maharashtra	9024	20.6	18.8	33.9	4.2	12.1	8.4	2.0
Madhya Pradesh	7576	8.5	26.1	50.1	2.7	6.6	4.8	1.2
Orissa	8948	1.0	30.6	40.3	7.1	6.9	13.4	0.7
West Bengal	9839	20.4	33.9	8.1	4.7	17.6	14.9	0.4
Pooled	***75600***	***16.5***	***28.6***	***26.5***	***6.1***	***10.4***	***10.2***	***1.7***

Table 5

Distribution (%) of Households by Adult Female Literacy status

States	n	Literacy status of adult female					
		Illiterate	Read & Write	1-4th Class	5-8th Class	9-12th Class	College
Kerala	10263	5.4	1.0	9.7	22.3	53.9	7.7
Tamilnadu	10627	48.3	0.3	7.1	26.6	15.8	1.9
Karnataka	8778	71.9	0.1	3.8	13.1	9.7	1.4
Andhra Pradesh	10545	63.0	4.4	7.5	16.2	7.4	1.5
Maharashtra	9024	41.0	0.2	10.3	20.7	25.2	2.6
Madhya Pradesh	7576	75.6	3.1	3.7	12.6	4.0	1.0
Orissa	8948	58.2	1.6	13.3	15.6	8.7	2.6
West Bengal	9839	52.8	7.5	14.5	15.1	9.0	1.1
Pooled	***75600***	***50.9***	***2.3***	***8.9***	***18.1***	***17.3***	***2.5***

Table 6

Distribution (%) of Households by Family Size

States	Total	Family size			Mean (CI)
		< 4	5 - 7	≥ 8	
Kerala	10263	58.4	35.0	6.6	**4.7 (4.63 – 4.70)**
Tamilnadu	10627	52.6	42.6	4.8	**4.6 (4.60 – 4.66)**
Karnataka	8778	34.8	47.6	17.6	**5.5 (5.43 – 5.51)**
Andhra Pradesh	10545	57.7	39.9	2.4	**4.5 (4.46 – 4.51)**
Maharashtra	9024	33.3	56.9	9.8	**5.3 (5.24 – 5.31)**
Madhya Pradesh	7576	32.0	49.0	19.0	**5.6 (5.54 – 5.65)**
Orissa	8948	49.3	45.0	5.7	**4.8 (4.74 – 4.80)**
West Bengal	9839	69.3	28.8	1.9	**4.1 (4.12 – 4.17)**
Total	**75600**	**49.4**	**42.6**	**8.0**	**4.84 (4.83 – 4.85)**

Table 7

Distribution (%) of Households having sanitary latrine

States	n	Sanitary latrine Present
Kerala	10263	94.3
Tamilnadu	10627	19.9
Karnataka	8778	18.1
Andhra Pradesh	10545	17.3
Maharashtra	9024	16.2
Madhya Pradesh	7576	8.8
Orissa	8948	8.4
West Bengal	9839	20.9
Total	**75600**	**26.6**

Table 8

Prevalence (%) of signs and symptoms of vitamin A deficiency among 1-<5 year children

VITAMIN A DEFICIENCY	States								Total
	Kerala	Tamil Nadu	Karnataka	Andhra Pradesh	Maharashtra	Madhya Pradesh	Orissa	West Bengal	
n	8329	9197	8627	9327	8646	8777	9460	9228	71591
Night Blindness (XN)	**0**	**0.1 (0.04, 0.16)**	**0.2 (0.11, 0.29)**	**0.2 (0.11, 0.29)**	**1.1 (0.88, 1.31)**	**0.8 (0.61, 0.99)**	**0.1 (0.04, 0.16)**	**0.2 (0.11, 0.29)**	**0.3 (0.26, 0.34)**
Conjunctival Xerosis (X1A)	**0.1 (0.03, 0.17)**	**0.2 (0.11, 0.29)**	**2.2 (1.89, 2.51)**	**1.3 (1.07, 1.53)**	**1.3 (1.06, 1.54)**	**4.9 (4.45, 5.35)**	**0.3 (0.19, 0.41)**	**3.7 (3.31, 4.09)**	**1.8 (1.70, 1.90)**
Bitot Spots (X1B)	**0**	**0.5 (0.36, 0.64)**	**0.7 (0.52, 0.88)**	**1.2 (0.98, 1.42)**	**1.3 (1.06, 1.54)**	**1.4 (1.15, 1.65)**	**0.3` (0.19, 0.41)**	**0.6 (0.44, 0.76)**	**0.8 (0.73, 0.87)**

Figures in the parentheses indicate confidence intervals

Table 9

Prevalence (%) of IDD among 6 - <12 years children

States	n	Goitre			Deaf-mutism	Mental retar-dation
		Grade I	Grade II	Total		
Kerala	3601	0.4	0.2	0.6	0	0
Tamil Nadu	3888	0.0	0.0	0.0	0.2	0.4
Karnataka	3436	1.6	0.1	1.7	0	0.1
Andhra Pradesh	3622	3.6	0.2	3.8	0.1	0
Maharashtra	3482	10.9	1.0	11.9	0.4	0.4
Madhya Pradesh	3343	3.0	0.8	3.8	0.1	0
Orissa	3575	0.1	0.0	0.1	0	0
West Bengal	3490	7.4	1.6	9.0	0.1	0
Pooled	***28437***	***3.3***	***0.5***	***3.8***	***0.1***	***0.1***

Table 10

Distribution (%) of Households by Iodine content of cooking salt – By Spot test

States	n	Iodine Level (ppm)				≥15 ppm
		0	7	15	30	
Kerala	559	24.2	25.9	46.7	3.2	49.9
Tamilnadu	658	46.1	28.3	16.9	8.7	25.6
Karnataka	621	67.3	7.9	11.6	13.2	24.8
Andhra Pradesh	720	34.3	36.0	20.4	9.3	29.7
Maharashtra	698	58.3	12.6	21.1	8.0	29.1
Madhya Pradesh	601	45.8	45.7	7.8	0.7	8.5
Orissa	665	48.3	28.4	13.4	9.9	23.3
West Bengal	687	14.8	30.6	43.5	11.1	54.6
Pooled	***5209***	***42.4***	***26.9***	***22.5***	***8.2***	***30.7***

Table 11

Mean ±SE of Haemoglobin levels (g/dl) by Age/Sex/Physiological Groups

States	1-<5 Years (Boys + Girls)	Adolescent Girls		Pregnant Women (≥24 wks)	Lactating Women (<6 mths)
		12 – 14 Yrs	15 – 17 Yrs		
Kerala	11.4 ± 0.07 (369)	11.8 ± 0.07 (342)	11.8 ± 0.07 (364)	10.9 ± 0.08 (279)	11.7 ± 0.07 (338)
Tamil Nadu	10.3 ± 0.08 (407)	11.8 ± 0.08 (407)	11.4 ± 0.09 (406)	9.9 ± 0.09 (384)	10.8 ± 0.1 (400)
Karnataka	10.2 ± 0.08 (425)	11.5 ± 0.08 (424)	11.0 ± 0.09 (424)	9.5 ± 0.09 (386)	10.6 ± 0.1 (392)
Andhra Pradesh	10.1 ± 0.08 (448)	10.9 ± 0.08 (443)	10.7 ± 0.09 (446)	9.9 ± 0.08 (416)	10.7 ± 0.09 (439)
Maharashtra	10.4 ± 0.08 (404)	11.5 ± 0.08 (415)	11.3 ± 0.08 (418)	9.7 ± 0.08 (386)	10.8 ± 0.09 (410)
Madhya Pradesh	10.3 ± 0.09 (394)	10.7 ± 0.09 (393)	10.7 ± 0.09 (393)	9.3 ± 0.09 (340)	9.9 ± 0.1 (382)
Orissa	9.6 ± 0.05 (407)	10.6 ± 0.07 (436)	10.7 ± 0.07 (433)	9.7 ± 0.08 (356)	10.0 ± 0.08 (408)
West Bengal	10.1 ± 0.05 (437)	10.8 ± 0.05 (435)	11.0 ± 0.05 (437)	10.2 ± 0.05 (436)	10.3 ± 0.04 (437)
Pooled	***10.3*** **± 0.03 (3291)**	***11.2*** **± 0.03 (3295)**	***11.1*** **± 0.03 (3321)**	***9.9*** **± 0.03 (2983)**	***10.6*** **± 0.03 (3206)**

Figures in the parenthesis indicate numbers

Table 12

Prevalence (%) of anaemia among 1- <5 Years children

States	n	Normal (≥11 g/dl)	Anaemia			
			Mild (10-11 g/dl)	Moderate (7-10 g/dl)	Severe (<7 g/dl)	Total (CI)
Kerala	369	66.3	20.1	13.3	0.3	33.7 (28.8, 38.4)
Tamil Nadu	407	37.3	22.4	36.1	4.2	62.7 (58.0, 67.3)
Karnataka	425	33.6	20.7	43.3	2.4	66.4 (61.9, 70.9)
Andhra Pradesh	448	29.2	24.8	42.2	3.8	70.8 (66.6, 75.0)
Maharashtra	404	40.9	20.5	35.6	3.0	59.1 (54.3, 63.9)
Madhya Pradesh	394	35.3	24.1	38.1	2.5	64.7 (60.0, 69.4)
Orissa	407	7.6	22.1	69.8	0.5	92.4 (89.8, 95.0)
West Bengal	437	18.8	34.1	47.1	0.0	81.2 (77.5, 84.9)
Pooled	***3291***	***33.1***	***23.7***	***41.1***	***2.1***	***66.9 (65.3, 68.5)***

Table 13

Prevalence (%) of anaemia among 12-14 Year Girls

States	n	Normal (≥12 g/dl)	Anaemia			
			Mild (10-12 g/dl)	Moderate (7-10 g/dl)	Severe (<7 g/dl)	Total (CI)
Kerala	342	45.6	45.0	9.4	0.0	54.4 (49.1, 59.7)
Tamil Nadu	407	46.3	38.3	15.2	0.2	53.7 (49.0, 58.6)
Karnataka	424	38.2	44.6	17.0	0.2	61.8 (57.2, 66.4)
Andhra Pradesh	443	27.3	46.9	23.3	2.5	72.7 (68.6, 76.8)
Maharashtra	415	42.2	39.5	17.8	0.5	57.8 (53.0, 62.6)
Madhya Pradesh	393	27.7	38.4	29.8	4.1	72.3 (67.9, 76.7)
Orissa	436	17.9	50.0	31.0	1.1	82.1 (78.5, 85.7)
West Bengal	435	9.9	69.2	20.7	0.2	90.1 (87.3, 92.9)
Pooled	***3295***	***31.3***	***46.8***	***20.8***	***1.1***	***68.7 (67.1, 70.3)***

Table 14

Prevalence (%) of anaemia among 15-17 Year Girls

States	n	Normal (≥12 g/dl)	Anaemia			
			Mild (10-12 g/dl)	Moderate (7-10 g/dl)	Severe (<7 g/dl)	Total (CI)
Kerala	364	50.8	39.0	9.9	0.3	49.2 (44.1, 54.3)
Tamil Nadu	406	40.6	39.7	17.2	2.5	59.4 (54.6, 64.2)
Karnataka	424	33.0	40.8	24.3	1.9	67.0 (62.5, 71.5)
Andhra Pradesh	446	27.1	43.3	24.7	4.9	72.9 (68.8, 77.0)
Maharashtra	418	35.9	43.2	19.9	1.0	64.1 (59.5, 68.7)
Madhya Pradesh	393	23.9	41.5	32.1	2.5	76.1 (71.9, 80.3)
Orissa	433	22.4	50.3	26.1	1.2	77.6 (73.7, 81.5)
West Bengal	437	12.4	75.5	12.1	0.0	87.6 (84.5, 90.7)
Pooled	***3321***	***30.3***	***47.0***	***20.9***	***1.8***	***69.7 (68.1, 71.3)***

Table 15

Prevalence (%) of anaemia among pregnant women (>= 6 months)

States	n	Normal (≥11 g/dl)	Anaemia			
			Mild (10-11 g/dl)	Moderate (7-10 g/dl)	Severe (<7 g/dl)	Total (CI)
Kerala	279	49.8	23.3	26.5	0.4	50.2 (44.3, 56.1)
Tamil Nadu	384	31.0	20.3	42.2	6.5	69.0 (64.4, 73.6)
Karnataka	386	20.2	18.1	56.5	5.2	79.8 (75.8, 83.8)
Andhra Pradesh	416	26.2	24.5	44.7	4.6	73.8 (69.6, 78.0)
Maharashtra	386	24.1	22.0	49.8	4.1	75.9 (71.6, 80.2)
Madhya Pradesh	340	16.2	16.8	59.4	7.6	83.8 (79.9, 87.7)
Orissa	356	18.5	28.1	48.1	5.3	81.5 (77.5, 85.5)
West Bengal	436	22.9	39.4	37.2	0.5	77.1 (73.2, 81.0)
Pooled	***2983***	***25.4***	***24.4***	***45.9***	***4.3***	***74.6 (72.9, 76.1)***

Table 16

Prevalence (%) of anaemia among Lactating women (<6 months)

States	n	Normal (≥12 g/dl)	Anaemia			
			Mild (10-12 g/dl)	Moderate (7-10 g/dl)	Severe (<7 g/dl)	Total (CI)
Kerala	338	44.7	43.8	11.2	0.3	55.3 (50.0, 60.6)
Tamil Nadu	400	32.3	35.7	27.0	5.0	67.7 (63.2, 72.4)
Karnataka	392	25.5	38.2	33.2	3.1	74.5 (70.2, 78.8)
Andhra Pradesh	439	23.7	41.9	31.0	3.4	76.3 (72.3, 80.3)
Maharashtra	410	27.1	44.6	25.9	2.4	72.9 (68.6, 77.2)
Madhya Pradesh	382	14.1	33.0	46.1	6.8	85.9 (82.4, 89.4)
Orissa	408	8.8	43.9	42.4	4.9	91.2 (88.5, 93.9)
West Bengal	437	4.1	60.4	35.5	0.0	95.9 (94.0, 97.8)
Pooled	***3206***	***21.9***	***43.0***	***31.9***	***3.2***	***78.1 (76.7, 79.5)***

Table 17.1

Distribution (%) of Mothers of Index children by their knowledge* about Vitamin A and VAD

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
N	**148**	**322**	**359**	**402**	**309**	**340**	**410**	**391**	***2681***
Aware of Night blindness	27.7	50.6	32.9	57.0	62.5	21.2	48.5	24.0	***41.4***
Causes of Night Blindness									
Deficiency of Vitamin A	9.5	32.3	7.2	6.0	17.8	11.8	12.0	3.3	***12.1***
Dietary Inadequacy	9.5	33.9	9.7	29.4	17.2	3.5	5.4	5.4	***14.3***
Others	1.4	0.6	0.3	2.5	1.0	3.8	2.9	0	***1.6***
Other Signs of VAD									
Bitot spot	0	12.1	1.1	3.2	8.1	4.7	1.2	0	***3.8***
White Scar	0	3.4	1.4	0.2	1.6	0	0.7	0	***0.9***
Total Blindness	0	31.1	4.7	1.7	10.4	7.1	8.0	1.3	***8.1***
Others	0	0.3	0.3	0.2	0.6	0.3	3.7	0	***0.8***
Mode of treatment for VAD									
Consult Doctor	23.6	41.0	24.2	46.5	55.0	14.7	34.9	11.5	***31.7***
Supplement Vitamin A	5.4	25.5	2.5	3.5	11.0	7.9	3.9	1.5	***7.3***
Use of Household remedies	0	1.9	0.8	5.7	10.7	2.1	1.2	1.3	***3.1***
Others	1.4	1.2	0.3	3.5	1.0	0.9	0.7	2.0	***1.4***
Prevention of VAD by Dietary modifications									
Yes	16.2	34.2	18.4	34.8	39.2	14.1	25.9	6.4	***23.9***
Type of Foods to be consumed to prevent VAD									
Green leafy vegetables	7.4	33.5	10.6	29.9	35.6	8.5	13.7	5.1	***18.4***
Yellow coloured fruits	3.4	27.0	13.1	7.5	26.5	4.1	8.3	2.0	***11.5***
Animal foods	10.1	23.0	0.8	18.9	21.7	0.9	14.6	1.0	***11.3***
Nutritious foods	6.1	23.3	0.8	9.7	20.1	7.6	6.8	2.0	***9.3***
Others	0.7	4.0	0.6	0.7	2.9	0.9	2.0	0	***1.5***

* Multiple responses

Table 17.2

Distribution (%) of Index children according to particulars of receipt of massive dose vitamin A during the previous one year

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
N	**148**	**322**	**359**	**402**	**309**	**340**	**410**	**391**	***2681***
Received massive dose vitamin A during previous one year									
Yes	43.9	63.0	56.5	50.7	52.4	52.6	80.0	51.9	***57.7***
No	39.2	24.8	38.4	36.1	35.9	43.8	13.9	46.8	***34.4***
Do not know	16.9	12.1	5.0	13.2	11.7	3.5	6.1	1.3	***7.9***
Total number of doses received									
One dose	28.4	20.2	42.1	14.2	29.4	19.1	38.8	46.8	***30.3***
Two doses	10.1	30.4	14.5	35.1	22.7	33.2	41.2	3.8	***25.1***
Do not know	5.4	12.4	0	1.5	0.3	0.3	0	1.3	***2.3***
Time of receipt of last dose									
<6 months	11.5	43.8	26.7	18.4	39.8	27.9	69.3	34.3	***36.0***
6-11 months	12.8	5.6	29.8	30.1	12.0	22.1	10.5	15.6	***17.9***
Do not know	14.2	1.2	0	0.7	0.3	2.4	0.2	0.8	***1.5***
Place of administration of massive dose of Vitamin A									
Home	0	16.1	7.5	2.7	3.9	5.3	15.9	2.0	***7.2***
AWC	11.5	30.4	30.4	21.9	22.3	42.6	31.5	1.8	***24.7***
Sub-centre	5.4	2.2	5.0	17.7	13.3	0.9	10.2	46.0	***13.8***
PHC	7.4	0.3	12.3	4.2	9.7	0.3	6.6	0	***4.9***
Others	0	0.3	1.4	2.0	2.6	0.9	15.6	0	***3.3***
Massive dose of Vitamin A administered by									
AWW	5.4	31.4	4.2	1.5	2.3	11.8	32.9	2.3	***12.0***
MPHW (F)	7.4	14.9	24.8	42.3	48.9	34.4	43.7	21.7	***31.7***
MPHS (F)	1.4	3.1	27.6	3.7	0.3	2.9	2.0	25.8	***9.2***
Others	0	0	0	0.7	0.3	0.0	1.2	0.	***0.3***
Do not know	10.1	0	0	0.2	0	0.9	0	0	***0.7***

Table 17.3

Distribution (%) of Index children who received massive dose vitamin A according to the nature of Side effects* experienced

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**148**	**322**	**359**	**402**	**309**	**340**	**410**	**391**	***2681***
Experienced side effects									
Yes	0	0	0	0.5	1.3	0.9	1.0	2.0	***0.8***
Nature of side effects									
Headache	0.	0	0	0.2	0.0	0.0	0.0	0.0	***0.0***
Fever	0	0	0	0.2	1.3	0.9	0	0.3	***0.3***
Nausea	0	0	0	0	0	0	0	0.8	***0.1***
Vomiting	0	0	0	0	0	0	1.0	0.8	***0.3***
Loose motions	0	0	0	0	0	0	0	0.3	***0.0***
Others	0	0	0	0	0	0	0.2	0	***0.0***

* Multiple responses

Table 17.4

Distribution (%) of Index children* according to reasons for non-receipt of massive dose of Vitamin A

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**58**	**80**	**138**	**145**	**111**	**149**	**57**	**183**	***921***
Reasons for non-receipt of massive dose Vitamin A									
Not aware	50.0	53.8	12.3	51.0	32.4	55.0	28.1	9.8	***34.2***
Not offered	43.1	38.8	62.3	31.7	60.4	33.6	61.4	76.0	***52.0***
Time & place not convenient	0	3.8	19.6	4.1	0.0	1.3	5.3	6.0	***5.6***
Others	5.2	3.8	5.8	11.7	7.2	10.1	3.5	4.9	***7.1***
Refused because of side effects/ harmful	1.7	0	0	1.4	0	0	1.8	3.3	***1.1***

Those who reportedly not received massive dose Vitamin A during previous one year

Table 17.5

Distribution (%) of respondents* according to their opinion about the beneficial effects of supplementation of massive dose of Vitamin A to Index children

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**148**	**322**	**359**	**402**	**309**	**340**	**410**	**391**	***2681***
Consumption of massive dose of vitamin A is beneficial									
Yes	58.5	77.3	93.1	56.9	74.1	38.5	68.0	12.8	***60.6***
Beneficial effects+									
Improved Health	50.8	55.7	70.9	39.7	51.2	22.9	54.9	4.9	***44.3***
Absence of Infections	0	37.4	19.2	6.9	6.8	0.6	4.3	0.5	***10.1***
Eyes are healthy	3.1	63.1	9.4	19.6	42.6	19.6	6.4	9.9	***21.6***
Others	4.6	3.9	0	2.9	1.2	1.1	4.9	0	***2.4***

* Mothers of children who received at least one dose of massive Vitamin A during previous 1 year
\+ Multiple responses

Table 17.6

Distribution (%) of respondents according to particulars of Nutrition Education received* on VAD

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
N	**148**	**322**	**359**	**402**	**309**	**340**	**410**	**391**	***2681***
Received Nutrition education on VAD									
Yes	1.4	37.6	11.7	19.2	16.2	12.1	3.7	1.3	**13.2**
Messages Received*									
Signs & symptoms	0.7	16.8	8.4	3.2	12.0	0.3	1.7	0	***5.3***
Consequences of severe VAD	0	20.2	4.7	0.7	10.4	0	0.5	0	***4.4***
Prevention & control	0	14.9	2.2	1.7	11.3	0.3	0.5	0.3	***3.8***
Suppl. of Vit. A to 9-35 months children	0	18.6	2.8	4.0	12.6	7.4	1.0	0	***5.7***
Consumption of GLV	1.4	33.5	3.3	15.9	14.2	5.3	1.7	1.0	***9.7***
Consumption of Yellow Colored fruits	0	29.2	4.7	5.5	10.0	1.5	0.2	1.0	***6.5***
Growing kitchen garden	0	27.6	1.1	2.2	1.6	2.1	1.0	0.3	***4.4***
Others	0	7.1	0.6	0.7	0	0.6	0.5	0	***1.2***

* Multiple responses

Table 18

Distribution (%) of Women (pregnant, lactating, and mothers of preschool children) by their knowledge* about IDA

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**436**	**709**	**926**	**1022**	**908**	**843**	**915**	**685**	***6444***
Awareness of anaemia	39.7	50.6	33.0	62.5	34.6	8.5	15.4	26.4	***33.9***
Signs & Symptoms of Anaemia									
Paleness	22.7	22.4	9.5	41.7	12.8	2.7	6.0	16.1	***16.7***
Tiresomeness	23.6	42.3	28.0	40.4	30.8	4.3	5.0	9.5	***23.3***
Palpitations	0.2	13.4	1.0	2.3	12.7	0.5	1.4	3.2	***4.4***
Breathlessness	0.5	10.7	1.3	11.8	9.8	2.0	0.8	2.3	***5.3***
Causes of Anaemia									
Inadequate diet	24.3	47.7	27.0	50.9	31.4	3.8	6.1	10.7	***25.8***
Iron deficiency	7.8	8.2	5.3	1.2	4.5	1.7	1.5	2.3	***3.7***
Frequent pregnancies	0.0	1.8	0.6	2.9	7.0	1.1	0.2	0.9	***2.0***
Blood loss	2.1	5.4	5.7	10.5	4.3	1.5	1.4	2.3	***4.5***
Worm Infestations	0.2	1.6	1.4	0.7	3.3	0	0	0.4	***1.0***
Infections	1.6	4.1	0.6	4.0	5.5	0.1	0.1	0	***2.1***
Treatment for Anaemia									
Consult Doctor	37.2	45.7	31.5	58.2	31.5	6.8	9.7	15.8	***29.7***
Consume Iron Tablets	6.0	8.7	3.2	1.6	6.6	2.4	0.8	3.4	***3.8***
Household Remedies	0.7	5.6	1.2	6.8	7.2	0.6	0.3	0.3	***3.1***

* Multiple responses

Table 19.1

Distribution (%) of Pregnant women according to particulars of receipt of IFA Tablets

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**144**	**258**	**299**	**330**	**308**	**258**	**269**	**187**	***2053***
Received IFA tablet	38.2	62.4	67.2	48.5	77.6	51.2	72.9	70.6	***62.2***
IFA Tablets distributed by									
AWW	3.5	1.6	3.0	6.4	1.9	9.7	24.9	4.8	***7.1***
MPHW (F)	5.6	41.5	28.1	38.5	61.7	39.1	43.1	20.9	***37.6***
MPHS (F)	0	2.3	25.8	1.8	1.6	1.9	0	43.3	***8.8***
MO-PHC	20.8	8.9	9.4	1.5	8.1	0.4	4.1	1.1	***6.1***
Others	8.3	8.1	1.0	0.3	4.2	0	0.7	0.5	***2.6***
Place of distribution of IFA Tablets									
Home	3.5	5.0	27.4	13.9	12.0	5.8	26.0	2.7	***13.3***
AWC	1.4	7.8	8.7	12.4	19.5	32.9	16.0	4.3	***13.9***
Sub-Centre	2.8	31.0	11.0	13.6	21.8	9.7	13.0	62.6	***19.8***
PHC	21.5	10.9	18.1	7.3	18.8	1.6	11.2	0.5	***11.2***
Others	9.0	7.8	2.0	1.2	5.5	1.2	6.7	0.5	***4.0***
Frequency of supply of IFA tablets									
Weekly	1.4	1.6	1.0	2.1	1.9	0	0.4	0	***1.1***
Fortnightly	0.7	1.6	1.7	2.7	6.5	0	0.4	1.6	***2.1***
Monthly	21.5	34.9	46.5	30.6	36.4	23.6	12.6	68.4	***33.9***
At a time	6.9	24.0	12.7	12.1	23.4	26.4	58.7	0.5	***21.9***
Irregular	7.6	0.4	5.4	0.9	9.4	1.2	0.7	0	***3.2***
No. of IFA Tablets received each time									
10	1.4	2.3	1.3	1.8	1.3	0.0	0.4	0.0	***1.1***
20	0	1.9	2.0	3.3	4.9	0.4	0.4	1.6	***2.0***
30-60	22.2	41.1	48.2	32.4	53.9	27.1	21.6	68.4	***39.5***
61-90	6.9	16.3	10.4	10.0	14.3	15.1	48.0	0.5	***16.0***
>90	7.6	0.8	5.4	0.9	3.2	8.5	2.6	0	***3.5***

Table 19.2

Distribution (%) of Pregnant women according to number of IFA tablets received

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**144**	**258**	**299**	**330**	**308**	**258**	**269**	**187**	***2053***
Received IFA tablet	38.2	62.4	67.2	48.5	77.6	51.2	72.9	70.6	***62.2***
Total number of IFA Tablets received									
10-30	1.4	5.4	1.3	4.2	2.9	0.4	0.7	1.1	***2.3***
30-59	10.4	24.0	11.0	13.6	23.4	10.1	17.5	27.8	***17.1***
60-89	8.3	10.9	15.4	16.1	15.9	7.4	3.7	24.1	***12.8***
≥90	18.1	22.1	39.5	14.5	35.4	33.3	50.9	17.6	***29.9***

Table 19.3

Distribution (%) of Pregnant women according to side effects experienced on consumption of IFA tablets

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
Number who consumed IFA Tablets	**55**	**161**	**201**	**160**	**239**	**132**	**196**	**132**	***1276***
Experienced side effects	5.5	4.3	6.5	20.6	8.4	11.4	9.2	6.1	***9.2***
Nature of side effects									
Diarrhoea	1.8	0.6	1.5	1.3	2.5	0	0	0	***1.0***
Black stools	0	0	0	6.3	0.8	0	0.5	1.5	***1.2***
Giddiness	0	2.5	0	1.3	1.7	2.3	1.0	0	***1.2***
Nausea	1.8	1.9	1.0	15.0	4.6	9.1	5.1	0.8	***5.0***
Vomiting	1.8	1.2	3.5	11.9	2.1	9.1	2.6	0.8	***4.1***

* Multiple responses

Table 20.1

Distribution (%) of Lactating women according to particulars of receipt of IFA Tablets

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**175**	**233**	**304**	**340**	**312**	**288**	**314**	**247**	***2213***
Received IFA tablet	12.0	7.7	8.2	9.7	27.2	14.2	10.8	6.5	***12.3***
IFA Tablets distributed by									
AWW	4.0	0.9	0.7	0.3	0.6	3.1	3.2	1.2	***1.6***
MPHW (F)	0	3.4	3.3	7.4	22.1	10.4	6.1	1.2	***7.4***
MPHS (F)	0	0	3.0	1.8	0.6	0.3	0	3.6	***1.2***
MO-PHC	5.7	2.1	1.3	0.3	1.9	0.3	0.6	0.4	***1.4***
Others	2.3	1.3	0	0	1.9	0	1.0	0	***0.7***
Place of distribution of IFA Tablets									
Home	2.3	0.4	5.6	2.9	10.9	1.7	4.5	0.8	***3.9***
AWC	1.1	2.1	0	1.8	2.2	9.4	1.9	2.4	***2.7***
Sub-Centre	0.6	1.7	0.3	3.2	7.1	1.7	1.3	2.4	***2.4***
PHC	5.7	1.7	2.0	1.5	4.8	0.3	1.0	0.8	***2.1***
Others	2.3	1.7	0.3	0.3	2.2	1.0	2.2	0	***1.2***
Frequency of supply of IFA tablets									
Weekly	1.7	0.4	0.7	0	1.9	0.6	0	0	***0.7***
Fortnightly	1.1	0	0	0.6	1.0	0	0.3	0.4	***0.4***
Monthly	2.3	4.3	1.6	2.1	6.7	8.7	2.5	6.1	***4.3***
At a time	4.0	3.0	5.3	6.5	16.0	4.2	7.6	0	***6.2***
Irregular	2.9	0	0.7	0.6	1.6	0.7	0.3	0	***0.8***
No. of IFA Tablets received each time									
10	1.7	0	0.7	0	1.6	0.3	0	0	***0.5***
20	0	0	0.3	0.6	2.9	0	0.3	0.4	***0.6***
30-60	3.4	4.7	2.0	2.6	16.7	8.7	3.5	6.1	***6.1***
61-90	4.0	3.0	4.6	5.9	4.8	3.8	5.7	0	***4.2***
>90	2.9	0	0.7	0.6	1.3	1.4	1.3	0	***0.9***

Table 20.2

Distribution (%) of Lactating women according to number of IFA Tablets received

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**175**	**233**	**304**	**340**	**312**	**288**	**314**	**247**	***2213***
Received IFA tablet	12.0	7.7	8.2	9.7	27.2	14.2	10.8	6.5	***12.3***
Total number of IFA Tablets received									
10-30	0.6	0.4	0.7	2.6	4.8	0.3	1.3	0.4	***1.5***
30-59	4.6	3.4	4.9	5.6	12.2	5.9	2.9	3.6	***5.6***
60-89	0.6	2.1	2.0	0.9	1.9	1.0	0.6	2.0	***1.4***
≥90	6.3	1.7	0.7	0.6	8.3	6.9	6.1	0.4	***3.8***

Table 20.3

Distribution (%) of Lactating women according to the side effects experienced on consumption of IFA tablets

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
Number who consumed IFA Tablets	**21**	**18**	**25**	**33**	**85**	**41**	**34**	**16**	***273***
Experienced side effects	4.8	0.0	8.0	9.1	3.5	4.9	0.0	0.0	***4.0***
Nature of side effects									
Diarrhoea	0	0	0	0	2.4	0	0	0	***0.7***
Black stools	0	0	0	3.0	0	0	0	0	***0.4***
Giddiness	0	0	0	0	1.2	2.4	0	0	***0.7***
Nausea	0	0	0	9.1	0	0	0	0	***1.1***
Vomiting	4.8	0	8.0	6.1	0	0	0	0	***1.8***

* Multiple responses

Table 21.1

Distribution (%) of respondents according to particulars of receipt of IFA Tablets by 1-<5 year children

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**117**	**218**	**323**	**352**	**288**	**297**	**332**	**251**	***2178***
Received IFA tablet	1.7	4.1	2.2	1.1	11.8	4.4	3.9	0	***3.8***
IFA Tablets distributed by									
AWW	0.9	1.4	1.2	0.3	5.6	1.7	1.8	0	***1.7***
MPHW (F)	0	2.3	0.3	0.9	6.3	1.7	2.1	0	***1.8***
MPHS (F)	0	0	0.3	0	0	1.0	0	0	***0.2***
MO-PHC	0.9	0.5	0.3	0	0	0	0	0	***0.1***
Place of distribution of IFA Tablets									
Home	0	0.5	0.6	0.3	2.8	1.0	1.5	0	***0.9***
AWC	0	2.8	0.9	0.6	7.3	2.0	1.8	0	***2.0***
Sub-Centre	0	0.5	0.3	0	0.7	1.3	0.6	0	***0.5***
PHC	1.7	0	0.3	0	0.7	0	0	0	***0.2***
Others	0	0.5	0	0.3	0.3	0	0	0	***0.1***
Frequency of supply of IFA tablets									
Weekly	0	0.9	0	0.3	4.8	0.3	0	0	***0.8***
Fortnightly	0	0	0.6	0	0	0	0	0	***0.1***
Monthly	0.9	1.4	1.2	0.3	1.7	2.0	0.9	0	***1.1***
At a time	0	1.4	0.3	0.6	4.9	2.0	2.7	0	***1.6***
Irregular	0.9	0.5	0	0	0.3	0	0.3	0	***0.2***
No. of IFA Tablets received each time									
10	0	0.9	0	0.3	3.5	0.3	0	0	***0.6***
20	0	0	0.6	0.3	0	0.3	0	0	***0.2***
30-60	0.9	1.4	1.2	0.3	5.2	2.0	1.2	0	***1.6***
61-90	0	1.4	0.3	0.3	2.8	1.7	1.8	0	***1.1***
>90	0.9	0.5	0	0	0.3	0	0.9	0	***0.3***

Table 21.2

Distribution (%) of respondents according to number of IFA Tablets received by 1-<5 year children

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**117**	**218**	**323**	**352**	**288**	**297**	**332**	**251**	***2178***
Received IFA tablet	1.7	4.1	2.2	1.1	11.8	4.4	3.9	0	***3.8***
Total number of IFA Tablets received									
10-30	0	0.5	0	0.6	0.7	0.3	0.6	0	***0.4***
30-59	0	0.5	0.3	0.6	6.3	0.3	1.2	0	***1.2***
60-89	0	0	0.6	0	1.4	0.3	0	0	***0.3***
≥90	1.7	3.2	1.2	0	3.5	3.4	2.1	0	***1.8***

Table 21.3

Distribution (%) of respondents according to the side effects experienced by 1-<5 year children on consumption of IFA tablets

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
Number who consumed IFA Tablets	**2**	**9**	**7**	**4**	**34**	**13**	**13**	**0**	***82***
Experienced side effects	0	0.5	0	0.6	0.7	0	0.3	0	***0.3***
Nature of side effects									
Diarrhoea	0	0	0	0	0.3	0	0	0	***0.0***
Black stools	0	0	0	0	0.3	0	0.3	0	***0.1***
Giddiness	0	0.5	0	0.6	0.7	0	0.3	0	***0.3***
Nausea	0	0.5	0	0.3	0.3	0	0	0	***0.1***
Vomiting	0	0.5	0	0.3	0.7	0	0	0	***0.2***

* Multiple responses

Table 22

Distribution (%) of Women (pregnant, lactating, and mothers of preschool children) according to reasons for non-receipt or partial receipt of IFA tablets

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
N	**397**	**641**	**802**	**972**	**763**	**727**	**752**	**651**	***5705***
Not received or partially (<90 Tab) received	91.1	90.5	86.6	95.1	84.0	86.2	82.2	95.0	***88.5***
Reasons for not receiving or partial receipt (<90) of IFA tablets									
Not aware	17.1	3.9	5.5	22.8	11.8	52.0	21.1	3.1	***17.6***
Not offered	39.3	67.6	67.6	39.7	44.2	32.0	57.6	72.7	***52.5***
Not received next supply	4.5	3.6	3.1	3.4	12.2	2.9	3.5	1.8	***4.4***
Refused for fear of side effects	0.5	1.2	2.6	3.8	2.2	1.2	1.7	1.2	***2.0***
Time & place not convenient	0.3	0.5	0.5	0.8	1.2	1.7	2.0	1.1	***1.0***
Prefer Pvt. practitioner	30.2	10.6	11.6	21.0	13.4	3.6	7.2	6.0	***12.4***
Still continuing	3.5	11.1	7.9	6.6	9.4	4.3	3.2	13.5	***7.5***
Others	4.5	1.6	1.2	1.9	5.6	2.3	3.7	0.6	***2.6***

* Multiple responses

Table 23

Distribution (%) of Women (pregnant, lactating, and mothers of preschool children) according to particulars of nutrition education received* on IDA

Particulars	States								Pooled
	Kerala	Tamil Nadu	Karna -taka	Andhra Pradesh	Mahara-shtra	Madhya Pradesh	Orissa	West Bengal	
n	**436**	**709**	**926**	**1022**	**908**	**843**	**915**	**685**	***6444***
Received Nutrition Education	1.8	26.1	19.1	25.4	15.4	4.9	6.4	0.6	***13.6***
Messages received*									
Signs & symp-toms of IDA	0.9	5.4	15.4	16.0	11.7	0.4	1.0	0.1	***7.3***
Consequences of IDA	0.9	10.0	4.0	3.8	10.0	0.1	1.1	0	***3.9***
Prevention & control of IDA	0.5	3.0	2.3	1.0	8.0	1.1	0.2	0	***2.1***
Consumption of IFA tablets	0.2	15.0	3.1	5.8	11.9	3.2	1.5	0.3	***5.4***
Consumption of Iron Rich foods	0.9	24.0	10.5	8.3	10.0	1.3	2.4	0.6	***7.5***

* Multiple responses

Table 24

Prevalence of vitamin A deficiency among 1-<5 year children by Socio-economic Variables

Socio Economic Particulars		N	VAD		
			XN	X1A	X1B
Religion	Hindu	61083	0.4[a]	1.8[a]	0.8[a]
	Muslim	7598	0.1[b]	1.5[a]	0.3[b]
	Christian	2564	0.0[b]	0.2[b]	0.2[b]
	Others	346	0.6[a]	1.4[a]	1.2[a]
Community	ST	7468	0.6[a]	4.2[a]	1.2[a]
	SC	13886	0.7[a]	2.4[b]	1.4[a]
	OBC	30023	0.2[b]	0.9[c]	0.6[b]
	Others	20214	0.1[c]	1.6[d]	0.4[c]
Occupation	Agri. Labourers	11372	0.6[a]	2.4[a]	1.3[a]
	Other Labourers	21090	0.3[bc]	2.0[b]	0.9[b]
	Cultivators	19361	0.4[b]	1.8[b]	0.6[c]
	Artisans	4435	0.2[c]	1.1[cd]	0.5[c]
	Service	6925	0.2[c]	1.4[c]	0.4[c]
	Business	7282	0.0[d]	0.9[d]	0.3[c]
	Others	1126	0.2[abc]	0.5[d]	0.4[bc]
Family size	≤4	32807	0.2[a]	1.4[a]	0.6[a]
	5 – 7	30496	0.4[b]	2.1[b]	1.0[b]
	≥ 8	8288	0.5[b]	2.1[b]	0.7[a]
Adult Female Literacy	Illiterate	37406	0.5[a]	2.6[a]	1.1[a]
	Literate	34124	0.2[b]	0.8[b]	0.4[b]
Sanitary Latrine	Absent	54242	0.4[a]	2.1[a]	0.9[a]
	Present	17349	0.0[b]	0.5[b]	0.2[b]
Pooled		***71591***	***0.3***	***1.8***	***0.8***

Values in the same column with different superscripts are significantly ($p<0.05$) different for the given variable.

Table 25.1

Prevalence (%) of Anaemia among 1-<5 year children and Adolescent girls by Socio Economic Indicators

Socio Economic Particulars		Anaemia (%)					
		N	1-<5 Yrs Children	Adolescent Girls			
				N	12-14 Yrs	N	15-17 Yrs
Religion	Hindu	2861	68.2 [a]	2907	69.5 [a]	2897	71.0 [a]
	Muslim	299	63.5 [a]	281	66.5 [ab]	302	64.6 [b]
	Christian	117	45.3 [b]	97	55.7 [bc]	112	51.8 [c]
	Others	14	64.3 [ab]	10	30.0 [c]	10	50.0 [abc]
Community	ST	364	76.1 [a]	322	79.8 [a]	332	83.7 [a]
	SC	699	72.1 [ac]	693	72.0 [b]	669	72.6 [b]
	OBC	1340	61.1 [b]	1364	63.9 [c]	1368	65.1 [c]
	Others	888	67.9 [c]	916	69.4 [b]	952	69.4 [b]
Occupation	Agri. Labourers	561	69.9 [a]	534	72.5 [a]	494	73.1 [a]
	Other Labourers	960	66.4 [ab]	893	69.3 [ab]	842	69.5 [a]
	Cultivators	943	68.6 [ac]	1023	65.8 [b]	1098	68.9 [ab]
	Artisans	182	68.7 [ab]	189	64.0 [bc]	193	69.9 [ab]
	Service	300	62.0 [b]	326	71.8 [ac]	330	71.5 [a]
	Business	297	63.3 [bc]	286	69.6 [ab]	282	68.4 [ab]
	Others	48	58.3 [ab]	44	68.2 [ab]	82	58.5 [b]
Family size	≤4	1521	69.1 [a]	965	71.0 [a]	1065	69.7 [a]
	5 - 7	1399	65.9 [ab]	1962	68.2 [ab]	1838	69.6 [a]
	≥ 8	371	62.0 [b]	368	64.9 [b]	418	70.3 [a]
Adult Female Literacy	Illiterate	1755	71.3 [a]	2003	71.2 [a]	2034	72.4 [a]
	Literate	1536	61.9 [b]	1292	64.8 [b]	1287	65.5 [b]
Sanitary Latrine	Absent	2567	71.2 [a]	2576	70.8 [a]	2549	72.3 [a]
	Present	724	51.8 [b]	719	60.9 [b]	772	61.3 [b]
Pooled		***3291***	***66.9***	***3295***	***68.7***	***3321***	***69.7***

Values in the same column with different superscripts are significantly ($p<0.05$) different for the given variable.

Table 25.2

Prevalence (%) of Anaemia among Pregnant (≥24wks) and Lactating (<6 months) Women by Socio Economic Indicators

Socio Economic Particulars		Anaemia (%)			
		N	Pregnant	N	Lactating
Religion	Hindu	2618	75.5 [a]	2789	78.8 [a]
	Muslim	272	70.6 [a]	298	78.2 [a]
	Christian	83	57.8 [b]	110	61.8 [b]
	Others	10	80.0 [ab]	9	55.6 [ab]
Community	ST	288	84.0 [a]	337	90.5 [a]
	SC	635	77.6 [b]	691	81.6 [b]
	OBC	1241	70.3 [c]	1268	71.8 [c]
	Others	819	75.3 [b]	910	79.5 [b]
Occupation	Agri. Labourers	507	79.1 [ac]	508	81.5 [a]
	Other Labourers	832	70.7 [bd]	880	79.0 [a]
	Cultivators	852	78.8 [ad]	922	78.3 [a]
	Artisans	205	71.2 [bd]	209	70.8 [bcd]
	Service	262	71.4 [bd]	298	76.5 [ac]
	Business	282	73.0 [bc]	342	78.1 [ad]
	Others	43	58.1 [d]	47	61.7 [b]
Family size	≤4	1942	74.6 [a]	1607	80.6 [a]
	5 - 7	779	73.8 [a]	1222	75.8 [b]
	≥ 8	262	76.3 [a]	377	74.8 [b]
Adult Female Literacy	Illiterate	1473	78.7 [a]	1624	83.6 [a]
	Literate	1510	70.5 [b]	1582	72.4 [b]
Sanitary Latrine	Absent	2315	77.5 [a]	2451	81.8 [a]
	Present	668	64.5 [b]	755	66.0 [b]
Pooled		***2983***	***74.6***	***3206***	***78.1***

Values in the same column with different superscripts are significantly ($p<0.05$) different for the given variable.

Table 26

Prevalence (%) of Total Goitre and extent of household use of Iodised salt by Socio-Economic variables

Socio Economic Indicators		N	Prevalence of Goitre	N	% HHs Consuming salt with Iodine content of ≥ 15 ppm
Religion	Hindu	24330	3.9 [a]	4610	29.5 [a]
	Muslim	2877	4.0 [a]	428	40.4 [b]
	Christian	1079	0.5 [b]	158	38.6 [b]
	Others	151	2.0 [a]	13	23.1 [ab]
Community	ST	2818	5.7 [a]	596	18.6 [a]
	SC	5467	4.8 [ac]	1109	27.0 [b]
	OBC	12149	2.5 [b]	2091	29.5 [b]
	Others	8003	4.5 [c]	1413	40.6 [c]
Occupation	Agri. Labourers	4583	4.9 [a]	902	27.5 [a]
	Other Labourers	8358	3.1 [b]	1480	30.7 [a]
	Cultivators	7726	3.9 [c]	1595	22.9 [b]
	Artisans	1635	2.8 [b]	282	32.6 [a]
	Service	2876	4.6 [ac]	466	46.8 [c]
	Business	2849	3.8 [bc]	427	46.8 [c]
	Others	410	2.4 [bd]	57	39.3 [ac]
Family size	≤4	9608	3.6 [a]	1732	36.5 [a]
	5 - 7	15662	4.1 [b]	2920	28.8 [b]
	≥ 8	3167	3.1 [a]	557	22.6 [c]
Adult Female Literacy	Illiteracy	15635	4.1 [a]	2979	23.4 [a]
	Literate	12781	3.4 [b]	2230	40.4 [b]
Sanitary Latrine	Absent	21318	4.3 [a]	4108	25.3 [a]
	Present	7119	2.3 [b]	1101	50.8 [b]
Pooled		***28437***	***3.8***	***5209***	***30.7***

Values in the same column with different superscripts are significantly ($p<0.05$) different for the given variable.

Table 27

Logistic Regression: Association of Socio-Economic variables with prevalence of Micronutrient Deficiencies (MND)

Dependent Variable MND Sign	Independent Variables	Odds Ratio	Confidence Interval
Clinical			
Bitot Spots among Preschool children	0.86 (ST + SC) 0.44 BC 1.23 SL 0.50 Adult Female Literacy 0.39 Family size (5-7) 0.41 Labourer (Occupation) -7.25	2.36 1.55 3.42 1.65 1.47 1.50	1.8-3.1 1.2-2.0 2.3-5.2 1.3-2.0 1.2-1.7 1.1-2.0
Goitre among 6-<12 yrs children	0.10 (ST + SC) 0.57 SL 1.80 Hindu 1.95 Muslim - 4.8	1.10 1.76 6.04 7.00	0.9-1.3 1.5-2.1 2.5-14.6 2.8-17.3
Haemoglobin			
Preschool Children	0.78 SL 0.12 (ST + SC) 0.65 Hindu 0.71 Muslim - 0.28	2.17 1.13 1.92 2.03	1.8-2.6 0.9-1.4 1.3-2.8 1.3-3.2
12-14 Years Girls	0.16 (ST + SC) 0.49 SL 0.83	1.18 1.64	1.0-1.5 1.3-2.0
15-17 Years Girls	0.25 (ST + SC) 0.36 SL 0.56 Hindu 0.06	1.23 1.43 1.75	1.0-1.6 1.2-1.7 1.2-2.6
Pregnant Women	0.47 SL 0.19 (ST + SC) 0.20 Adult Female Literacy 0.71	1.60 1.21 1.23	1.3-2.0 1.0-1.5 1.0-1.5
Lactating Women	0.60 SL 0.40 Adult Female Literacy 1.04	1.82 1.49	1.5-2.2 1.2-1.8

SL: Sanitary Latrine,

ST: Schedule Tribe, SC: Schedule Caste, BC: Backward Classes