

Diet and Nutritional Status of Rural Preschool Children in the State of Orissa

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ABSTRACT The data on diet and nutritional status of preschool children at State level is available, however the same is not available at district level for planning appropriate action programmes at that level. Hence in keeping view of this objective the present paper focused on to assess the diet and nutritional status of rural preschool children at district level in the State of Orissa. This study was conducted in rural areas of 30 districts in the State of Orissa. Dietary history was obtained from 1,605 preschool children and about 6,803 children (1-6 Yrs) were covered for anthropometry and clinical examination. The data revealed that the mean intakes of majority of foods except cereals and millets, roots and tubers and vegetables were below the recommended dietary intakes in both the age groups of preschool children. Similarly, in general, the intakes of majority of nutrients were below the RDA. The overall prevalence of Kwashiorkor and Marasmus was 1.1% each. The prevalence of Bitot's spots was 2.7%. About 63% of preschool children were stunted and underweighed. Majority of preschool children was subsisting on inadequate diets and the diets were grossly deficient of micronutrients such as riboflavin, vitamin A and iron. The poor dietary intakes are reflected by higher prevalence of stunting and underweight.

INTRODUCTION

India accounts for about 40% of undernourished children in the World, contributing significantly to the high morbidity and mortality in the country (James Levinson 1998). A recent appraisal of diet and nutrition situation in rural India by National Nutrition Monitoring Bureau (2001) revealed that about 45 percent of the preschool children are undernourished (weight for age < 75% of standard) while about 62% are stunted (height for age < Median-2SD of standard). About 47% of the adults had Chronic Energy Deficiency (CED, BMI <18.5).

The National Plan of Action on nutrition (under National Nutrition Policy 1993 and 1995) aims at bringing down the prevalence of existing undernutrition among children by half and low birth weight to less than 10%. Data on nutritional status of the community at district level is essential for planning appropriate action programmes at that level.

A survey was hence carried out in the State of Orissa during 1995-96 at the request of Directorate of Women and Child Development (DWCD), Government of India, to assess diet and nutritional situation of rural population at the district level.

The State of Orissa has a total population of 367 millions (Census of India, 2001) contri-

buted to 3.6% of the country's population. The State has second highest proportion of tribal population (22%) after the State of Madhya Pradesh as against the national average 8%. The State of Orissa is socio-economically much backward as compared to most of the other States in the country.

Objective: To assess the diet and nutritional status of rural preschool children at district level in the State of Orissa.

MATERIAL AND METHODS

Sampling Design: The survey was carried out in all the 30 districts of the State. In each district, twenty villages were selected, giving due representation to all the blocks/ Taluks in the district, by adopting systematic random sampling (SRS) procedure, coupled with probability proportion to size (PPS) (Cochran, 1972).

In each village, five clusters of four households (HHs) each, i.e., a total of 20 HHs, were selected by adopting 'cluster sampling' procedure, by dividing it into geographical regions/parts, considering a group of households/streets/mohallas/area as one group. Scheduled Caste/Scheduled Tribe population, considered to be socially and economically backward, who often live together in the village, formed one of the clusters. While one cluster was selected from

SC/ST region, four clusters were selected from the rest of the regions. From each of these five, the first household was chosen by random start and four contiguous households were covered for survey. Thus, in the five clusters, a total of 20 households (4 HHs/cluster) were surveyed in each village.

Demographic and socio-economic particulars of all the selected households surveyed were collected, using pre-coded and pre-tested proforma. Individual intakes in terms of cooked foods and nutrients were assessed in every alternate household by using 24-hour recall method of diet survey using standardized cups (Thimmayamma et al., 1969). The nutritive value of raw foods was calculated using food consumption tables (Gopalan et al., 1993). Anthropometrical measurements such as height and weight were taken on all the preschool children in the selected HHs, using standard equipment by adopting standard procedures (Weiner and Lourie, 1969). Children were also examined for clinical signs of nutritional deficiency disorders. All the investigators were trained and standardised in the methodology of diet surveys, anthropometry and clinical assessment to ensure that inter and intra-individual variations were within the acceptable limits. In this communication are presented data on dietary intakes and anthropometry of 1-6 years children were utilized.

Food and Nutrient Intake of Preschool Children: The average daily intakes of various foods were calculated for 1-3 years and 4-6 years age old children. The mean Nutrient intakes were calculated. The food intakes were compared with the balanced diets recommended by the ICMR (1981) and nutrient intakes were compared with the recommended dietary allowances for Indians (ICMR, 1990).

Anthropometry: The age / sex wise heights and weights of children, pooled for all the districts were compared with NCHS median values (Hamill et al., 1979) and were categorized into different grades of nutritional status by SD classification according to 'weight for age', 'height for age' and 'weight for height'. The results were compared with the figures reported by National Nutrition Monitoring Bureau survey, 1999.

The results are also compared between the regions. For this purpose three regions were categorized viz central region (Cuttack,

Jagatsingpur, Kendrapara, Jajpur, Balosore, Bhadrak, Mayurbhanj, Puri, Khordha and Nayagarh), Southern region (Ganjam, Gajapati, Boudh, Phulbani, Koraput, Nabarangpur, Rayagada, Malkangiri, Kalahandi, and Nawapada) and Northern region (Sambalpur, Baragarh, Deogarh, Jharsuguda, Sundergarh, Balangir, Sonepur, Dhenkanal, Angul, and Kheonjhar) to study the regional variations if any in nutritional status of preschool children.

The foods and nutrient intakes by children (1-6 years) and their nutritional status are analyzed for all the districts.

The nutritional status and percent of RDA of protein and energy intakes of children pooled for all the districts was compared with different socio-economic and demographic indicators such as community, type of house, land holdings, annual *per capita* income etc.

With respect to communities, nutritional status of SC/ST and other communities was compared. The type of house is one of the generally accepted indices to determine socio-economic status of the inhabiting household. Comparisons were made among children living in *Kutch*, *semi-pucca* and reinforced cement concrete (RCC) houses. The relationship between nutritional status and land holdings was carried out by considering the size of cultivable land in possession, the farmers marginal (< 2.5 acres) and small (2.5-5 acres) and large farmers (≥ 5 acres).

Statistical Analysis: Descriptive analysis was performed using the windows version of SPSS, Version-10 (1999). The data was analyzed by stratifying the pre-school children into two age groups of 1-3 years and 4-6 years. Means of various food and nutrient intakes were calculated for each age group. Chi-square analysis was performed to study the association between nutritional status of pre-school children with socioeconomic variables and to compare the same with the result of the NNMB survey for the state of Orissa.

RESULTS

Coverage: A total of 11,984 households (HHs) from 600 villages from 30 districts were covered for the survey in the state of Orissa. Data on food and nutrient intake was collected from a sub sample of 5,931 HHs covering a total of 1,605 children (1-6 yrs). About 6803 preschool

children (1-6 yrs) from 11,984 HHs were covered for anthropometry and clinical examination.

Demographic and Socio-economic Profile:

About 28% of the households belonged to Scheduled Tribes, while about 23% belonged to Scheduled Castes. The proportion of Scheduled Tribes was highest in the district of Malkangiri and lowest in the district of Jagatsinghpur. The proportion of Scheduled Caste ranged from a low 4.5% in the district of Mayurbhanj to a high 38% in the district of Bhadrak. About 65% of the sample lived in *kutcha* houses. About 33% of the households surveyed were land less. The average family size was 5.2 for the State, which ranged from a low 4 in Jharsuguda district, to a high 6.6 Jajpur.

The average *per capita* annual income of the HHs was Rs.3,240/-, which ranged from a low Rs.2,276/- in the district of Nawapara to high Rs.4,580/- in the district of Jharsiguda. It was much lower than the National average of

Rs.11,554/- (Statistical abstract of Andhra Pradesh, 1999). The proportion of HHs with per capita annual income of less than Rs.5,000/- was about 85% for the State and it ranged from a low 67.5% in Jharsuguda to a high 94.5% in the district of Kalahandi.

Food and Nutrient Intakes of 1-6 years Children: The average intake of different foodstuffs by age groups is presented in Tables 1 and 2.

In general, the average intake of all the foods except cereals and millets, roots and tubers and other vegetables was lower than the RDI in both 1-3 and 4-6 year age groups. The consumption of cereals and millets in 1-3 year age group was more than the RDA in 50% of the districts and, in the case of 4-6 year age group, it was about 63% of the districts.

The average intake of different nutrients by age is given in Tables 3 and 4. The mean consumption of all the important nutrients was below the RDA in 1-3 years age group. In none

Table 1: Average intake of foodstuffs (g/day) among 1-3 year children

Name of the districts	Number of individuals	Cereals and millets	Pulses and legumes	GLV	Roots and tubers	Other vegetables	Milk and milk products	Fats and oils	Sugar and jaggery
Angul	30	200	16	28	41	55	15	4	3
Balangir	38	237	23	8	21	51	13	7	3
Balasore	26	243	9	15	42	46	32	4	20
Baragarah	31	237	36	7	29	38	6	6	17
Boudh	28	226	27	32	24	47	2	5	3
Bhadrak	30	205	14	15	73	32	3	3	1
Cuttack	25	101	11	27	35	29	36	3	6
Deogarh	35	222	7	20	28	24	4	4	1
Dhenkanal	26	145	14	3	52	39	30	2	13
Ganjam	27	179	11	7	86	53	0	6	2
Gajapati	41	163	26	9	24	33	2	3	2
Jagatsinghpur	14	87	6	9	32	11	14	3	1
Jajpur	32	165	12	14	71	34	59	5	16
Jharsuguda	11	135	14	32	31	67	98	5	8
Kalahandi	28	185	18	15	25	18	12	6	3
Kendrapara	31	198	4	17	35	51	10	3	4
Keonjhar	24	181	8	28	79	39	3	3	5
Khurda	21	120	7	1	49	25	20	7	3
Koraput	33	129	12	11	20	24	6	1	1
Malkangiri	22	100	7	12	10	35	0	2	0
Mayurbhanj	36	195	6	33	25	31	0	2	2
Nowrangpur	39	237	28	22	19	28	9	3	20
Nawapara	41	169	15	18	20	68	2	3	12
Nayagarh	19	118	4	12	53	27	1	7	5
Phulbani	33	198	22	14	15	35	2	1	9
Puri	24	116	5	4	39	25	23	5	5
Rayagada	27	128	9	7	21	30	0	2	2
Sambalpur	16	124	12	11	42	49	63	3	7
Sonepur	12	80	13	3	38	41	15	1	4
Sundergarh	12	184	14	18	46	51	3	3	6
Pooled	812	175	15	15	36	38	13	4	6
RDI		175	35	40	10	20	300	15	30

Table 2: Average intake of foodstuffs (g/day) among 4 - 6 year children

Name of the districts	n	Cereals and millets	Pulses and legumes	GLV	Roots and tubers	Other vegetables	Milk and milk products	Fats and oils	Sugar and jaggery
Angul	34	285	20	33	59	60	6	3	3
Balangir	25	359	40	9	45	44	12	7	5
Balasore	35	340	10	18	75	45	73	7	18
Baragarah	32	423	48	14	49	39	12	8	28
Boudh	31	278	42	24	31	43	9	4	6
Bhadrak	27	326	10	17	91	37	12	2	9
Cuttack	27	272	16	35	95	56	1	6	12
Deogarh	30	373	14	17	49	33	0	4	1
Dhenkanal	32	195	11	18	70	58	13	4	12
Ganjam	30	275	19	8	100	71	0	6	2
Gajapati	43	284	22	16	25	44	4	2	3
Jagatsinghpur	28	120	14	12	62	18	7	5	3
Jajpur	46	252	17	13	83	60	16	6	7
Jharsuguda	10	192	21	31	67	129	119	11	13
Kalahandi	24	320	17	30	30	31	2	7	3
Kendrapara	20	318	10	20	52	70	5	2	9
Keonjhar	15	324	4	24	86	49	3	3	5
Khurda	18	222	16	11	58	33	13	11	5
Koraput	25	295	14	19	20	55	1	2	1
Malkangiri	24	208	10	13	19	48	0	4	1
Mayurbhanj	27	313	8	35	34	49	0	3	4
Nowrangpur	27	318	37	28	23	56	15	5	23
Nawapara	42	257	18	7	28	78	4	3	11
Nayagarh	17	239	14	22	57	28	11	9	11
Phulbani	33	281	22	53	18	36	2	2	7
Puri	24	202	6	6	83	27	10	7	4
Rayagada	33	226	18	11	16	44	0	3	1
Sambalpur	6	314	25	10	110	142	14	4	3
Sonepur	15	217	8	12	84	62	7	3	6
Sundergarh	13	285	22	31	98	72	9	5	7
Pooled	793	279	19	20	53	50	11	5	8
RDI		270	35	50	20	30	250	25	40

of the districts, the diets of the children satisfied the suggested levels for energy, iron and riboflavin. In only about a third of the districts (30%), the consumption of protein was satisfactory. The mean consumption of vitamin A was below RDA in all the districts barring Cuttack, Boudh and Keonjhar. The proportion of children with inadequate intakes was maximum for riboflavin (71%) followed by vitamin A (53%), calcium (51%) and iron (50%).

Similarly, among 4-6 year children the intakes of all the nutrients except for thiamin and vitamin-C were below the RDA. In about a third of the districts (37%), the protein intake was more than the suggested level. In a majority of the districts, the diets of 4-6 year children were inadequate in energy, iron, vitamin A and riboflavin. The extent of deficit was maximum for riboflavin (70%) followed by iron (56%) and vitamin A (46%).

Proportion of Households with intake of Nutrients below 70% of RDA: The district wise proportion of HHs with micro nutrient intakes of <70% of RDAs are presented in Figure 1.

The intake of iron was less than 70% of RDA in a majority of the HHs in most of the districts, the proportion of which ranged from 69% in the districts of Balasore and Puri to a high 98% in the district of Malkangiri. Similarly, in case of vitamin-A, the proportion of HHs with the consumption level of <70% of RDI ranged from about 56% in the district of Keonjar to a high of 93% in Khurda district. With regard to intake of riboflavin, the proportion ranged from a low 73% in the district of Rayagada to 100% in the districts of Mayurbhanj, Puri and Keondrapara.

Nutritional Deficiency Signs: Though the number of children covered for clinical assessment is not adequate at district level, the prevalences of clinical forms of nutritional

Table 3: Average daily intake of nutrients among 1-3 year children

Name of the districts	n	Protein (g)	Total Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Thiamin (mg)	Ribo- flavin (mg)	Vitamin C (mg)	Free Folic Acid (µg)
Angul	30	21	7	882	175	6	174	0.6	0.2	33	25
Balangir	38	24	10	1037	151	5	158	0.7	0.2	26	34
Balasore	26	28	9	1123	284	7	237	0.7	0.3	34	31
Baragarah	31	30	9	1145	140	6	137	0.7	0.3	29	32
Boudh	28	29	8	1030	234	7	424	0.8	0.3	38	38
Bhadrak	30	26	5	902	217	7	259	0.6	0.2	35	28
Cuttack	25	15	9	555	240	5	407	0.4	0.2	35	20
Deogarh	35	22	6	908	161	5	229	0.6	0.2	39	34
Dhenkanal	26	17	6	717	143	9	77	0.5	0.2	29	19
Ganjam	27	19	7	839	134	4	73	0.6	0.2	38	26
Gajapati	41	21	5	737	146	6	104	0.4	0.2	18	17
Jagatsinghpur	14	11	5	424	181	3	127	0.3	0.1	15	13
Jajpur	32	24	11	886	429	8	240	0.6	0.3	36	22
Jharsuguda	11	21	13	773	352	4	381	0.5	0.3	74	21
Kalahandi	28	21	8	840	202	4	209	0.5	0.2	21	25
Kendrapara	31	17	5	818	91	4	50	0.6	0.2	39	25
Keonjhar	24	19	5	837	221	6	434	0.5	0.2	78	21
Khurda	21	14	10	617	102	6	33	0.4	0.2	19	16
Koraput	33	16	3	552	220	6	129	0.4	0.2	11	16
Malkangiri	22	12	3	416	123	3	73	0.2	0.1	22	14
Mayurbhanj	36	18	4	786	189	9	323	0.5	0.2	54	22
Nowrangpur	39	29	6	1086	399	11	255	0.7	0.3	33	40
Nawapara	41	19	5	798	179	7	171	0.6	0.3	49	24
Nayagarh	19	14	8	587	108	6	33	0.4	0.1	37	16
Phulbani	33	23	3	849	122	8	124	0.6	0.2	19	27
Puri	24	14	9	588	179	5	54	0.4	0.1	19	14
Rayagada	27	13	4	544	206	4	99	0.3	0.2	9	13
Sambalpur	16	18	9	665	248	5	209	0.5	0.2	28	19
Sonepur	12	11	3	411	83	2	64	0.3	0.1	16	13
Sundergarh	12	18	5	795	104	6	123	0.5	0.2	38	26
Pooled	812	20	6	803	195	6	190	0.5	0.2	32	24
RDI		22		1240	400	12	400	0.6	0.7	40	30

deficiency signs pooled for all the districts is presented. The overall prevalence of kwashiorkor and marasmus the clinical signs of protein energy malnutrition was 1.1% each. The prevalence of kwashiorkor (1.5%) and marasmus (1.3%) was significantly higher among 1-3 yrs age group as compared to 4-6 yrs age group (0.6% each). The overall prevalence of Bitot spots, an objective sign of vitamin A deficiency was about 2.7% among the preschool children. The prevalence was significantly higher among 4-6 yrs (4.2%) as compared to 1-3 yrs age group (1.4%). In two thirds of the districts (60%), the prevalence of Bitot spots was more than 0.5%, a level suggested by WHO as a public health significance. A spearman rank correlation was computed between consumption of Vitamin A and prevalence of Bitot spot among 1-6 year children which revealed that there was an inverse relationship in intake of Vitamin A and prevalence of Bitot spot however it was

statistically not significant. In general, 1.3% and 3% of pre-school children had Glossitis and angular stomatitis respectively.

Anthropometry

Percent distribution pre-school children according to Standard Deviation Classification for height for age, weight for age and weight for height are presented in Table-5-6.

Weight for Age: The overall prevalence of underweight (<Median -2SD) was about 61% while that of severe underweight (<median - 3 SD) was about 25%. The prevalence of severe under weight was significantly low ($P<0.001$) among 4-6 year children (16.7%) as compared to 1-3 year children (28.2%) (Table 5). The prevalence of severe underweight among preschool children was marginally higher in the districts of northern region as compared to other two regions in both in 1-3 and 4-6 yrs age groups.

Table 4: Average daily intake of nutrients among 4-6 years children

Name of the districts	n	Protein (g)	Total Fat (g)	Energy (Kcal)	Calcium (mg)	Iron (mg)	Vitamin A (µg)	Thiamin (mg)	Ribo- flavin (mg)	Vitamin C (mg)	Free Folic Acid (µg)
Angul	34	27	5	1182	154	7	169	0.8	0.3	54	38
Balangir	25	37	11	1552	179	9	149	1.1	0.4	26	48
Balasore	35	40	16	1573	440	9	338	1.0	0.4	39	45
Baragarah	32	48	14	1932	241	10	222	1.2	0.5	45	53
Boudh	31	32	8	1254	250	7	337	0.9	0.3	31	46
Bhadrak	27	33	7	1366	221	11	319	0.9	0.3	35	39
Cuttack	27	33	9	1247	437	12	609	0.8	0.3	82	36
Deogarh	30	34	7	1480	315	7	209	1.0	0.3	47	49
Dhenkanal	32	22	7	921	227	7	193	0.6	0.2	34	25
Ganjam	30	29	8	1234	204	6	74	0.8	0.3	45	35
Gajapati	43	28	5	1144	251	7	176	0.7	0.3	25	25
Jagatsinghpur	28	15	6	600	134	5	174	0.4	0.2	29	20
Jajpur	46	29	10	1153	263	11	182	0.8	0.3	35	32
Jharsuguda	10	31	22	1166	475	6	472	0.8	0.5	90	43
Kalahandi	24	29	10	1300	249	6	312	0.7	0.3	21	34
Kendrapara	20	28	5	1292	250	8	161	0.9	0.3	47	37
Keonjhar	15	29	6	1328	226	6	250	0.8	0.3	73	40
Khurda	18	26	13	1051	348	8	26	0.7	0.2	30	28
Koraput	25	29	5	1150	406	10	191	0.9	0.3	14	33
Malkangiri	24	20	6	835	143	4	54	0.3	0.2	32	19
Mayurbhanj	27	27	5	1220	185	10	303	0.8	0.3	58	33
Nowrangpur	27	35	8	1434	323	11	261	1.0	0.4	55	50
Nawapara	42	26	6	1134	191	7	121	0.8	0.3	45	35
Nayagarh	17	30	13	1140	242	11	48	0.7	0.3	55	31
Phulbani	33	27	4	1143	218	8	296	0.8	0.3	60	38
Puri	24	21	12	958	153	7	101	0.6	0.2	34	26
Rayagada	33	23	5	920	203	6	156	0.6	0.3	14	20
Sambalpur	6	31	7	1384	175	8	173	1.0	0.3	38	42
Sonepur	15	20	5	936	135	4	179	0.6	0.2	32	28
Sundergarh	13	28	8	1257	165	6	177	0.9	0.3	77	40
Pooled	793	29	8	1211	246	8	218	0.8	0.3	41	35
RDA		30		1690	400	18	400	0.8	1.0	40	40

The prevalence of underweight was more than 75% in the districts of Jharsuguda, Sonepur and Sundergarh, while in rest of the districts it ranged from 50-75%. The prevalence of severe grade underweight was 25-50% in about a third (40%) of the districts, ranging from 13% in the district of Ganjam to 45% in Sundergarh.

Height for Age: The overall prevalence of stunting (< Median-2SD) among preschool children (1-6 yrs) was about 59%, and that of severe stunting (< Median - 3 SD) was about 30%. The prevalence of severe stunting (Median - 3 SD) was more in 4-6 year children as compared to 1-3 year children (32.4%). The overall prevalence of stunting (< Median-2SD) was more in the districts of northern region as compared to other regions among 1-3 year children (64%), while it was more in southern region among 4-6 year children (Table 5). The extent of stunting ranged from 41% in the district of Nayagarh to 77% in Sundergarh. In three

fourths (73%) of the districts surveyed, the prevalence of severe stunting (<Median - 3SD) was about 25-50% (Table 6).

Weight for Height: This is an index of current nutritional status and is a measure of wasting. In general, 21% of the children were wasted (<Median - 2SD) with 6.4% having severe wasting (<Median -3SD). No significant differences were observed between the children of 1-3 and 4-6 yrs age group. The prevalence of severe wasting was higher in central region (8.2%) as compared to other regions among 1-3 year children. While the overall wasting was more in northern region as compared to other regions among 4-6 year children. The prevalence of wasting was 25-50% in 11 districts, while it was less than 25% in the rest of the districts. Severe wasting ranged from nil in Cuttack to a high 17.4% in the district of Jagathsinghpur.

Nutritional Status of Pre School Children by Socio-Economic Variables: The overall

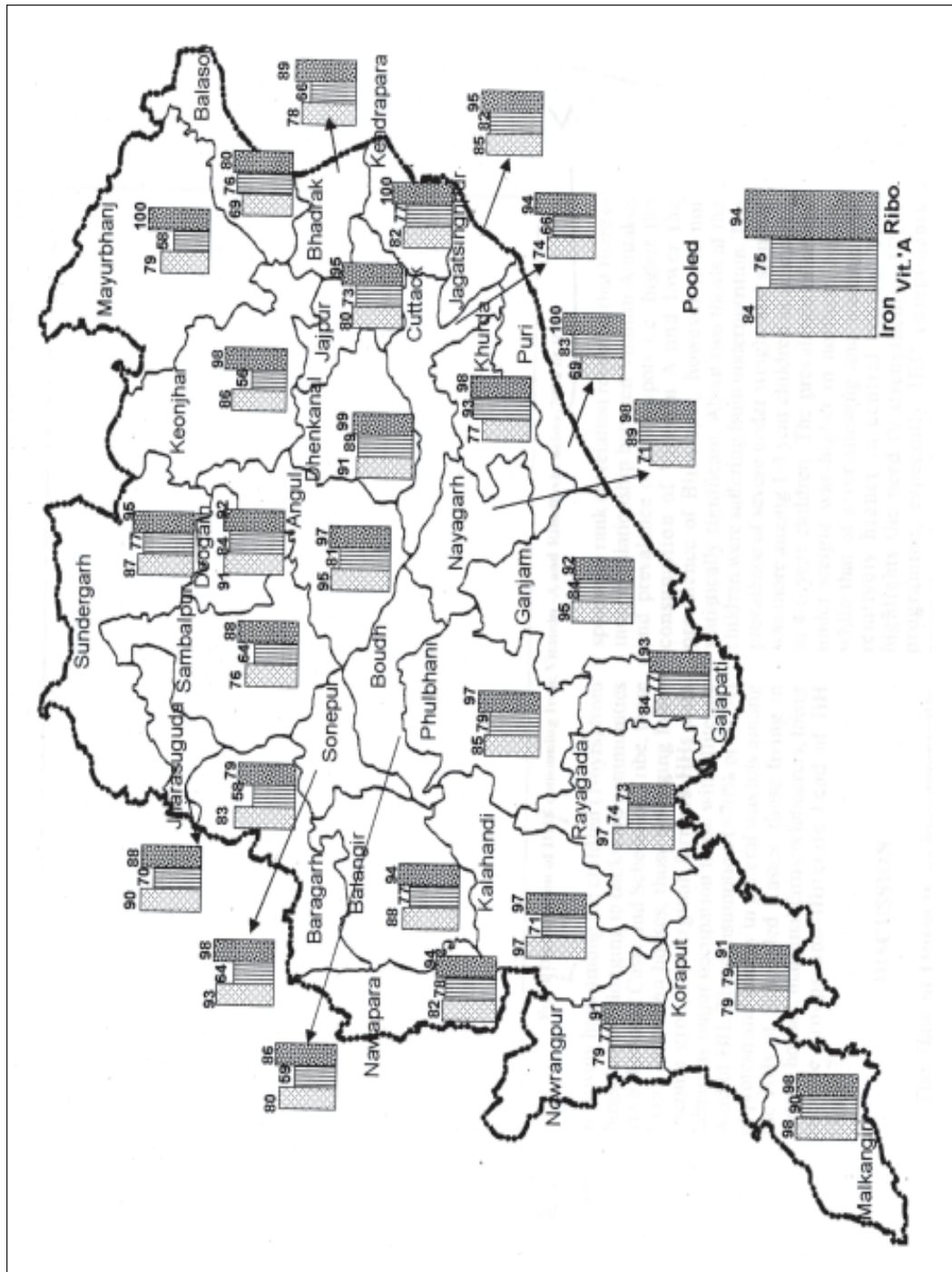


Fig. 1. Distribution of HHs consuming Iron, Vitamin -A and Riboflavin below <70% of RDA

prevalence of underweight ($<$ Median -2SD) was relatively high among the children (1-6yrs) from households belonging to backward communities viz Scheduled Caste and Scheduled Tribe, those living in *kutch* houses, those belonging lower income groups, marginal farmers HHs with labour as major occupation those with illiterate head of HH. The consumption ($<$ 70% of RDA) of protein and energy in general was low among the HHs of Scheduled Castes, those living in *kutch* houses, marginal farmers labourers, lower income groups and illiterate head of HH (Table 7).

DISCUSSION

The State of Orissa is socio-economically backward with a majority of HHs living in *kutch* houses, with an average *per capita* income of less than Rs.5,000/- per annum. The major occupation is labour and population is predominantly tribal. The district level survey revealed that all most all the pre-school children were subsisting on inadequate diets. The intake of protective foods such as green leafy vegetables, milk, pulses and legumes and that of fats and oils was grossly inadequate as compared to RDA. The diets were grossly deficient in some of the important micronutrients such as riboflavin, vitamin A and iron in both age groups. The spearman rank correlation revealed that there is inverse relationship between Vitamin A intakes and prevalence of Bitot spots i.e. higher the consumption of Vitamin A and lower the prevalence of Bitot spot, however it is not statistically significant. About two thirds of the children were suffering from undernutrition. The prevalence of severe under weight and stunting was more among 1-3 year children as compared to 4-6 year children. The prevalence of severe under weight was higher in northern region while that of severe stunting and wasting was relatively higher in central region. This highlights the need to strengthening ICDS programme, especially IEC components concerning breast-feeding and child rearing practices.

Nutritional status is major determinant of the health and well being of children. Inadequate diets and infections are associated with poor nutrition (NFHS-II,1999), Nutritional Status of pre-school children has direct impact on school enrollment and dropout rates.

The overall proportion of children with underweight in the State was comparable to the figure reported by NNMB for the state of Orissa (1996-97). The prevalence of stunting in the present study was significantly higher than the figures reported by NNMB for the state of Orissa. The wasting was marginally higher than the corresponding figures for the state of Orissa (NNMB 1996-97) (Table 6). The poor dietary intakes are reflected by higher prevalence of undernutrition among children. The other contributing factors could be poverty, as reflected by higher proportion of *kutch* houses, high proportion of HHs with annual per capita income less than Rs.5,000/- and majority of HHs with labour as major occupation. Cross-classification analysis (Table 7) revealed that variables like backward community, poor housing, low per capita income, nil or small land holding, labour and illiteracy were significantly associated with high prevalence of undernutrition. The other factors which could be influencing directly or indirectly the nutritional status of pre-school children such as duration of breast feeding, time of initiation of complementary feeding, extent of immunization, access to health care facilities, availability of protected water supply, environmental sanitation etc. need to be explored.

There is a need to sensitize the community through nutrition and health education, in order to improve the nutritional status of the children. The effort of NGO's as well as Government should be channelised in the direction of improving the household income by providing income generating activities, better housing and sanitary conditions, improving access to health care facilities and literacy status of the community to improve the over all health and nutritional status of the community.

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Table 5: Distribution (%) of preschool children by Nutritional Status by Regions: Standard Deviation Classification

Age Group	Region	n	Weight for Age		Height for Age		Weight for Height	
			<Median -3SD	<Median -2SD	<Median -3SD	<Median -2SD	<Median -3SD	<Median -2SD
1-3 yrs	Central	1259	27.0	62.0	34.0	62.0	8.2	21.4
	Southern	1612	27.8	67.1	29.3	60.3	6.0	22.1
	Northern	1723	29.5	64.9	34.1	64.0	6.2	21.2
	Pooled	4594	28.2	64.9	32.4	62.1	6.7	21.6
4-6 yrs	Central	629	15.6	49.3	28.3	54.5	6.2	16.9
	Southern	795	15.1	54.1	23.0	50.2	5.5	17.5
	Northern	785	19.2	56.6	23.6	50.1	6.1	23.6
	Pooled	2209	16.7	53.6	24.7	51.4	5.9	19.5
1-6 yrs	Central	1888	23.2	57.7	32.1	59.5	7.5	19.9
	Southern	2407	23.6	62.8	27.3	57.0	5.9	20.6
	Northern	2508	26.3	62.3	30.8	59.6	6.1	21.9
	Pooled	6803	24.5	61.2	29.9	58.6	6.4	20.9
P-value			<0.05	<0.001	<0.001	>0.05	>0.05	>0.05

Table 6: Distribution (%) of preschool children by nutritional status: Standard Deviation Classification

District	n	Weight for Age		Height for Age		Weight for Height	
		< Median -3SD	< Median -2SD	< Median -3SD	< Median -2SD	< Median -3SD	< Median -2SD
Angul	340	14.1	56.5	20.0	60.3	6.2	14.7
Balangir	286	23.1	60.2	24.1	56.6	5.2	18.5
Balasore	301	18.9	52.5	29.6	62.1	9.3	20.9
Baragarh	269	20.4	59.1	25.7	61.8	3.7	17.8
Boudh	306	28.1	62.2	30.7	60.1	3.3	22.9
Bhadrak	195	33.8	69.7	34.4	61.1	6.7	29.8
Cuttack	159	16.4	61.1	30.2	59.8	0.0	9.4
Deogarh	268	18.3	55.2	16.8	44.0	3.0	17.9
Dhenkanal	284	21.8	50.3	29.2	56.3	7.4	22.2
Ganjam	134	13.4	55.9	26.9	50.0	2.2	14.9
Gajapati	283	22.6	61.8	24.4	58.7	4.6	15.9
Jagatsinghpur	115	34.8	55.7	28.7	59.1	17.4	32.2
Jajpur	276	29.7	59.0	33.0	60.5	13.0	24.6
Jharsuguda	251	42.2	77.7	47.0	69.7	7.6	29.9
Kalahandi	224	24.6	68.4	24.1	54.0	6.3	25.5
Kendrapara	204	22.1	62.8	45.6	61.6	7.4	12.8
Keonjhar	201	19.9	59.7	24.9	57.2	3.5	15.9
Khurda	173	17.3	56.6	30.6	58.8	5.8	15.0
Koraput	254	29.5	63.4	23.6	48.8	11.0	24.8
Malkangiri	196	29.1	64.3	23.0	50.0	15.8	33.7
Mayurbhanj	205	19.0	55.6	31.2	53.6	3.9	16.1
Nowrangpur	298	23.5	65.8	26.8	54.3	4.4	24.2
Nawapara	291	22.3	60.8	26.8	60.8	4.1	16.5
Nayagarh	95	18.9	45.2	24.2	41.0	7.4	25.3
Phulbani	237	16.0	51.4	31.6	72.5	2.1	9.7
Puri	165	21.2	53.9	27.3	54.6	3.0	15.7
Rayagada	184	21.7	57.6	35.3	54.3	6.5	17.4
Sambalpur	160	29.4	68.8	33.1	61.9	9.4	26.3
Sonepur	204	36.8	76.0	36.3	52.5	13.7	34.8
Sundergarh	245	45.3	82.4	58.4	76.8	4.1	27.8
Pooled	6803	24.5	61.2	29.9	58.6	6.4	20.9
NNMB-96-97 (Orissa)	2334	14.8	59.3	14.7	45.0	2.4	19.1
χ^2		95.3 p < 0.001	2.62 NS	208.8 p < 0.001	129.96 p < 0.001	28.0 p < 0.001	3.46 NS

Table 7: Nutritional profile of rural population according to socio-economic variables

Socio-economic indicators		SD Classification (Weight for age) (Children 1-6 years)			Nutrient Intake < 70% of RDA		
		N	< Median -3SD	< Median -2SD	N	Protein (g)	Energy (Kcal)
Community	Scheduled Caste	1184	26.9	65.8	376	45.7	66.2
	Scheduled Tribe	1660	28.3	64.9	486	40.3	59.9
	Backward Caste	1325	21.3	59.2	406	28.8	49.3
	Others	977	21.9	59.0	337	32.6	54.3
	$\chi^2_{(3)}$		26.69,	21.0,			25.5
Type of House			p < 0.001	p < 0.001	29.0,	p < 0.001	p < 0.001
	Pucca	3	15.1	59.2	34	35.3	55.9
	Semi-Pucca	1594	24.1	61.0	474	31.2	50.2
	Kutchra	3459	25.6	63.3	1097	39.7	60.7
	$\chi^2_{(2)}$		6.31	3.0			15.0,
Land Holdings (Acres)			p < 0.01	(NS)	10.1,	p < 0.01	p < 0.001
	<2.5 (Marginal Farmers)	3751	24.8	62.7	1266	40.4	60.0
	2.5 – 5 (Small Farmers)	836	25.4	62.8	209	24.9	49.8
	≥ 5 (Larger Farmers)	559	25.0	60.4	130	24.6	46.2
	$\chi^2_{(2)}$		0.12	1.08,			15.1
Annual Per capita Income (Rs.)			(NS)	(NS)	27.8,	p < 0.001	p < 0.001
	<5000	4654	25.7	63.2	1442	38.0	58.5
	5000 – 10000	409	18.1	57.7	129	31.8	51.9
	≥ 10000	83	16.9	58.2	34	17.6	38.2
	$\chi^2_{(2)}$		14.6,	5.7			7.3
Occupation of head of HH			p < 0.001	NS	7.0,	p < 0.05	p < 0.05
	Landless Agri. Labour	751	25.7	64.8	194	43.3	60.8
	Other Labourers	1640	27.1	63.9	579	42.0	60.8
	Cultivators	1627	25.9	63.0	458	34.5	56.6
	Artisans	186	21.0	64.0	59	25.4	44.1
Literacy Status of head of HH	Service	415	17.6	58.8	139	25.9	51.1
	Business	301	21.9	53.1	113	34.5	57.5
	$\chi^2_{(5)}$		19.8, 1	17.1, 1			10.3
			p < 0.00	p < 0.00	21.6,	p < 0.001	NS
Literacy Status of head of HH	Illiterate	1810	27.3	64.8	541	43.6	63.4
	Read and Write	904	26.5	65.8	208	37.5	62.5
	Primary	846	24.3	62.4	253	34.0	55.3
	Upper Primary	860	23.8	59.1	301	34.9	51.5
	High. Secondary	613	20.1	57.9	224	30.4	50.0
Literacy Status of head of HH	College	113	14.2	49.6	53	26.4	50.5
	$\chi^2_{(5)}$		22.11,	26.25,			19.9
			p < 0.001	p < 0.001	18.5	p < 0.01	p < 0.001

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