Nutritional Assessment of the Warli Tribals of Maharashtra State

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ABSTRACT Over the last few decades the subject of Anthropology has evolved from a mere descriptive phase to analytical phase and further to interpretative phase. In this process many sub disciplines have modified their approach also in order to cope up with newer methodology. An integrative approach used in the present study is mainly to focus on the aim of the assessment, evaluation and interpretation of health, nutrition and child growth aspects of Warli tribal community of Maharashtra. The analysis described in this article 1) explore the role of anthropometry to check the validity and efficiency of measurements in predicting complications and outcome of nutrition, 2) derives the determinants of under nutrition and their extent, 3) estimates nutrient intake and the consumption pattern and 4) highlight treatment, intervention and prevention strategies. For this study the methods include anthropometry, clinical signs of malnutrition, haemoglobinopathy, diet and socio-economic survey and health culture and in-depth interviews. A sample of 1553 children (808 male and 745 female) in a 4 to 10 year's age range comprises approximately 515 families. Low calorie intake, food scarcity, lack of clean and hygienic drinking water, poor health care facilities and poor communication were some of the concluding results. Nutrition education, provision of safe drinking water facility, community involvement and participation in various programmes, monitoring and surveillance of growth and nutrition were some of the recommendations.

INTRODUCTION

Over the last few decades the subject of Anthropology has evolved from a mere descriptive phase to analytical phase and further to interpretative phase. In this process many subdisciplines have modified their approach in order to cope up with newer methodologies.

Anthropologists have had a long standing interest in diet and nutrition. Biological anthropologists have been particularly interested in questions of nutritional adaptations - that is, how humans adjust to variations in food intake as well as to particular components of the diet (Stintson, 1992). Examining the components of energy balance is one approach to understand better nutritional adaptations in children (Zamel et al., 1996). Between energy intake and energy expenditure, to maintain energy balance, a number of factors (nutriture) have tremendous influence on the adaptations in children (Darna L. Dufour, 1997).

AIM AND OBJECTIVES

The present study aims to understand the intricate dynamics of nutrition and growth of Warli children with the following objectives :

1. to explore the role of anthropometry in predicting normal and abnormal growth pattern, as related to nutritional outcome.
2. to identify the determinants of under nutrition and to assess its extent.
3. to estimate nutrient intake and the consumption pattern.
4. to suggest treatment, intervention and prevention strategies.

For the present (cross-sectional) study an integrative approach of essential methods of assessment of nutriture have been used mainly to focus on the aim of the assessment, evaluation and interpretation of health, nutrition and child growth aspects of Warli Tribal children of Maharashtra.

WHO ARE WARLIS

Warlis, one of the aboriginal tribes of Maharashtra, are mainly concentrated in Thane, Nasik and Greater Mumbai. The tribe is also found in Gujarat and Daman territory. According to 1981 census, the total number of Warlis in Maharashtra is 3,61,271 including 1,81,750 males and 1,79,521 females. Agriculture is the main occupation for the Warlis. Both males and females are engaged in agricultural activities. Subsidiary occupations include daily labourers

in Wadi's, building constructions and in industries. The adult males go to the nearby towns for such works after the harvest season is over. The Warlis have not been studied so extensively by adopting scientific integrative approach regarding their food habits, and nutrition. This report has taken care of some scattered information.

Monogamy is common, though polygyny is also sporadically observed. Both joint and nuclear family patterns exist. Warli family is patrilineal, patrilocal and patriarchal.

MATERIAL AND METHODS

A total of 1553 children (808 male and female) in 4 to 10 year's age range from approximately 515 families, were included in this cross sectional study.

The sample was selected from 24 villages of Peth Taluka of Nasik district, Maharashtra state. This Taluka has the maximum concentration of Warli tribals (99%) of all the populations. With the help of a few sorting criteria such as tribal concentration, (relative) Isolation, socio-economic conditions, communication facilities etc. these villages and the population were selected. The sample is justified because, "The sample studied depends on the purpose for which the study is done .... smaller number may suffice for studies of malnutrition in different groups of population, or for comparison of groups under different environmental circumstances" (Weiner and Lourie, 1969). The age - sex distribution of the present sample size is given in table 1.

An integrative approach of various essen-

tial methods include anthropometry, clinical signs of malnutrition, haemoglobinopathy, diet and socio-economic survey and a survey of health culture. Indepth interviews were conducted wherever required and through observations they were supplemented or complemented by additional informations.

In all 8 anthropometric measurements, Height, Weight, Mid-Upper arm Circumference, Skinfold at Triceps, Head Breadth, Head Length, Head Circumference and Chest Circumference were included. This selection was made as per the recommendations of Jelliffe (1966); IBP/HA Weiner and Lourie (1969) ; Malina (1980) etc. BMI - an index based on two basic measurements Height and Weight has been used in assessing nutritional status. (NIN-Report 1979).

The clinical examination considered were Hair, Face, Lips, Tongue, Teeth, Gums, Glands, Skin, Nails and Subcutaneous tissues, and the interpretation was done by "grouping of signs" principle.

Haemoglobin per cent, identification of Sickle cell trait and Sickle cell anaemia were also taken. Besides, indirect parameters *viz.*, Diet survey by using weighment method, 24 hour recall method and Food list method; Socio-economic information, data on Vital Statistics and Hygienic conditions, were also studied. Standard anthropometric and laboratory techniques and methods were used besides using the statistics as a tool (*e.g.* calculations of mean, standard error, percentiles etc.)

RESULTS OF ANALYSIS

The results of various anthropometric

Table 1: Age and sex distribution of the sample of Warli children

S. No.	Age group (yrs)	Boys N	Boys %	Girls N	Girls %	Total N	Total %
1	4 +	116	7.48	111	7.14	227	14.62
2	5 +	123	7.93	114	7.34	237	15.27
3	6 +	95	6.11	95	6.11	190	12.22
4	7 +	122	7.85	110	7.08	232	14.93
5	8 +	114	7.34	106	6.82	220	14.16
6	9 +	108	6.95	95	6.11	203	13.07
7	10 +	130	8.38	114	7.34	224	15.72
Total		808	52.05	745	47.94	1553	99.99

Note : Minimum size is 95 and maximum size is 130 for a signle age group.

Table 2: Height (cms): means; standard error for Warli boys and girls

S. No.	Boys Mean ± SE		Numbers	Age group	Girls Numbers	Girls Mean ± SE	
1	85.1	± 0.82	116	4 +	111	87.46	± 0.90
2	97.3	± 0.87	123	5 +	114	95.8	± 0.88
3	107.4	± 1.07	95	6 +	95	105.7	± 0.86
4	110.4	± 0.83	122	7 +	110	106.7	± 0.91
5	116.6	± 0.83	114	8 +	106	115.4	± 0.83
6	125.6	± 0.72	108	9 +	95	122.9	± 0.80
7	127.9	± 0.87	130	10 +	114	126.5	± 1.40

N = Size of the sample, SE = Standard Error

measurements, Body Mass Index (BMI) Classi-fication and the mean and standard error values show that majority of Warli children are under-nourished and fall under Grade-III- CED Cat-egory and much below the National and Inter-national reference values. The BMI classifica-tion shows 50% to 66% of CED Gr- III malnu-trition in different age categories.

Table 3: Comparative figures of mean height (cms) of NCHS, Indian boys (B) and girls (G) and present study

S. No.	Age group (in years)	Height (cms) Mean value NCHS (USA)[1]		India[2]		Present study[3]	
		B	g	B	G	B	G
1	4 +	–	–	–	–	85.0	87.5
2	5 +	108.9	179.9	107.1	106.0	99.3	95.0
3	6 +	116.1	115.4	113.7	113.0	107.4	105.7
4	7 +	122.6	120.6	118.6	118.2	110.4	106.7
5	8 +	128.1	127.4	124.1	122.7	116.7	115.4
6	9 +	131.6	133.2	130.4	128.6	125.2	123.0
7	10 +	138.1	138.5	134.7	134.8	128.0	126.5

1. 1977, 2. Agarwal et al., 1992, 3. Present Study 1995

Table 4: Distribution of Warli boys and girls accord-ing to Height for Age Classification (Vishveshware Rao's classification using NCHS standard)

Height of age classification (Vishveshwars Rao)	Age (yrs)	Boys No.	%	Girls No.	%	Total No.	%
80% of the standard = Poor							
	4 +	12	10.34	07	6.30	19	8.23
	5 +	14	11.38	13	11.40	27	11.39
	6 +	22	23.15	08	8.42	30	15.78
	7 +	23	18.85	10	9.09	33	13.97
	8 +	09	7.89	13	12.26	22	10.07
	9 +	06	5.55	12	12.63	18	9.09
	10 +	17	13.07	04	3.50	21	8.28
80-90 = Mild retardation							
	4 +	74	63.72	70	63.06	144	63.39
	5 +	79	64.22	76	66.66	155	65.44
	6 +	53	55.78	69	72.63	122	64.20
	7 +	57	46.72	66	60.00	123	53.36
	8 +	76	66.66	71	66.98	147	66.82
	9 +	68	62.96	60	63.15	128	63.05
	10 +	74	56.92	89	78.07	163	67.49
91 - 100% = Normal							
	4 +	30	25.85	34	30.62	64	28.28
	5 +	30	24.39	25	22.28	55	23.16
	6 +	21	22.09	18	19.93	39	20.02
	7 +	42	34.42	34	30.90	76	32.67
	8 +	29	25.38	22	20.75	51	23.11
	9 +	24	22.21	23	24.20	47	27.86
	10 +	39	30.00	21	18.41	50	24.23

Hanumantha Rao D. et al., 1976; Vijayraghavan K. et al., 1971

Table 5: Weight (kg): means and standard error for worli boys and girls

S. No.	Boys Mean ± SE	Num-bers	Age group	Girls Num-bers	Mean ± SE
1	9.69 ± 0.14	116	4 +	111	10.47 ± 0.17
2	12.17 ± 0.16	123	5 +	114	11.95 ± 0.17
3	14.96 ± 0.23	95	6 +	95	15.02 ± 0.30
4	16.45 ± 0.27	122	7 +	110	15.48 ± 0.30
5	18.68 ± 0.34	114	8 +	106	17.95 ± 0.39
6	21.65 ± 0.33	108	9 +	95	21.42 ± 0.34
7	22.77 ± 0.34	130	10 +	114	23.44 ± 0.45

N = Size of the sample, SE = Standard Error

Table 6: Comparative figures of mean weight (kg) of Indian boys (B) and girls (G) NCHS and present study

S. No.	Age group (in years)	NCHS (USA)[1] B	g	India[3] B	G	Present study[3] B	G
1	4 +	–	–	–	–	9.7	10.5
2	5 +	18.6	18.1	17.4	17.0	12.2	12.0
3	6 +	21.3	21.0	19.2	18.7	14.9	15.0
4	7 +	24.0	22.2	21.0	20.5	16.5	15.5
5	8 +	26.4	26.3	23.5	23.0	18.7	18.6
6	9 +	28.8	30.8	26.5	25.8	21.6	21.4
7	10 +	33.6	32.6	28.7	29.6	22.8	23.4

1. 1977, 2. Agarwal et al. 1992, 3. Present Study 1995

Highest = 66% at 5 + yrs; 64% at 10 + yrs; 50% at 4 + yrs. (Table 2,3,4,5,6,7,8,910). Al-though the Z-score values show a continuous trend in height and weight from lower to higher age groups for both boys and girls; the cut-off CHS Indicators reveal medium height and weight much below level. However, the prevalence level decreases with increase in age for both the sexes, showing thereby the vulnerability of youngstars to severe form of malnutrition (Table 11).

The distribution of hemoglobin values among Warli boys and girls are presented in ta-ble 12. Accordingly, 23.14% of the boys and 22.01% of girls suffer from early stage of anemia, whereas 22.52% and 21.20% of boys and girls respectively suffer from marked anemia i.e. showing hemoglobin level below 10 grams per-cent. A hemoglobin level of 10 to 11 grams has been defined as early anemia and a level below 10 grams as marked anemia (Sood and Rusia, 1986). According to WHO (1966) citeria, the cut off points for the diagnosis of anemia through hemoglobin estimation of children belonging to 6 to 10 years age group is 12 grams per cent. Anemia or deficiency should be considered to

Table 7: Distribution of Warli boys and girls according to Weight for Age Classification (Vishveshware Rao's classification using NCHS standard)

Weight of age classification (Indian Academy of Paediatrics)	Age (yrs)	Boys No.	%	Girls No.	%	Total No.	%
50% of the standard = Grade IV Malnutrition							
	4 +	46	39.6	40	36.0	86	37.8
	5 +	49	39.8	55	49.2	104	44.0
	6 +	39	40.6	43	45.2	82	42.9
	7 +	40	32.7	50	45.4	90	39.1
	8 +	50	43.8	49	46.2	99	45.0
	9 +	47	43.5	46	48.4	93	45.9
	10 +	56	43.0	59	51.7	115	43.7
51-60% of the standard = Grade III Malnutrition							
	4 +	39	33.6	21	18.9	60	26.2
	5 +	29	23.5	23	20.1	52	21.8
	6 +	16	16.6	26	27.3	42	21.9
	7 +	28	22.9	20	18.1	48	20.5
	8 +	24	21.0	22	20.7	46	20.8
	9 +	12	9.0	11	11.5	23	10.2
	10 +	17	13.0	13	11.4	30	12.2
61 - 70% of the standard = Grade II Malnutrition							
	4 +	07	6.0	23	20.7	30	13.3
	5 +	18	14.6	12	10.5	30	12.5
	6 +	21	21.8	08	8.4	29	15.1
	7 +	17	13.9	22	20.0	39	16.9
	8 +	19	16.6	18	16.9	37	16.7
	9 +	11	10.1	11	11.5	22	10.8
	10 +	20	15.4	19	16.6	39	15.9
71-80% of the standard = Grade I Malnutrition							
	4 +	09	7.7	10	9.0	19	8.3
	5 +	17	13.8	13	11.4	30	12.6
	6 +	09	9.3	08	8.4	17	8.8
	7 +	17	13.9	06	5.4	23	9.6
	8 +	13	11.4	11	10.3	24	10.8
	9 +	15	13.8	10	10.5	25	21.1
	10 +	18	13.8	07	6.2	24	9.5
> 80% of the standard = Normal							
	4 +	15	12.9	17	15.3	32	14.4
	5 +	10	8.1	11	9.6	21	8.8
	6 +	11	11.4	09	9.4	20	10.4
	7 +	20	16.3	07	6.3	27	11.3
	8 +	08	7.0	06	5.5	14	6.2
	9 +	23	21.2	17	17.8	40	19.5
	10 +	19	14.6	16	14.0	35	14.3

exist when hemoglobin level is below 12 grams among children of age range 6 to 10 years. The number of subjects whose hemoglobin is below 8.1 to 10 grams and 8.0 grams and below suffer from marked anemia (Sood and Rusia, 1986). Shukla (1982) mentions that over 54% of children had hemoglobin value less than 11 grams per cent, in a study conducted on children belonging to poor families. Anemia is a blood related condition in which hemoglobin has fallen below what is normal for a person. In iron deficiency anemia, there is a reduced hemoglobin (Cheesbrough and McArthur, 1976).

Anemia is the reduction in hemoglobin concentration in the blood below levels considered normal for the age and sex of the person. Hemoglobin is lowered and decreased in iron deficiency and folic acid or vitamin B 12 deficiency anemia (Bharucha et al., 1979).

In short, the haemoglobin levels are much below the normal (Early stage of Anaemia < 12 gm : Boys = 23.14% and Girls = 22.61%; marked anaemia < 10 gm: Boys = 22.52% and Girls = 21.20%) (Table 12). The nutritional disorders include PEM, anaemia, kwashiorkor, riboflavin deficiency, vitamin A and C deficiency in various frequencies (Table 15). In general the observations on clinical signs and symptoms reveal inadequacy of:

Nutritional disorders	Boys %	Girls %
Protein	11.67	–
Fe	7.14	11.5
Kwashiorkor	2.97	2.14
Vitamins	2.47	1.74

As a tribal community, the people belong to the marginal or low income levels, majority (63.66%) of them show the lowest income level (i.e. < Rs. 1000/ per month in cash; however they carry on food gathering and other manual activities to earn livelihood). Whereas middle income group is to the extent of 29.68% (Rs. 1500-2000 p.m.) and only 6.6% earn more than Rs. 2000/- p.m. This has ultimately reflected on their low purchasing power of at least the essential food items; which has affected the mean energy intake of KCal/day that is much lower than the RDA viz. a deficiency of 164 KCal/day for 4-6 yrs. boys and girls; 315 KCal/day for 7-9 yrs. boys and girls and 375 KCal/day for 10-12 yrs. boys and girls.

The diet of Indian mainly consists of cereals (McLaren, 1977) and the Warlis are no exception. The information gathered through 24 hr. recall method and weekly diet record, reveal that besides having monotonous diet, it contains mostly rice, nagli and less pulses and vegetables (record of well-off season Table 13, 14A, 14B).

The fact that the overall food availability to

Table 8: Age-sex classification of Warli by BMI status

Age group (in years)	Sex	BMI Classes									
		< 16		16-17		17-18.5		18.5-20		20-25	
		N	%	N	%	N	%	N	%	N	%
4 +	M	72	62.07	14	12.07	12	10.34	07	6.03	10	8.62
	F	65	58.16	20	18.02	11	9.91	06	5.40	09	8.11
5 +	M	94	68.29	09	7.31	13	10.57	12	9.75	04	3.25
	F	73	64.03	15	13.16	08	7.02	10	8.77	08	7.02
6 +	M	57	60.00	08	8.42	09	9.47	12	12.63	09	9.47
	F	53	55.79	14	14.73	07	7.73	11	11.58	10	10.53
7 +	M	69	56.56	28	22.95	10	8.19	08	6.56	07	5.74
	F	58	52.72	21	19.09	13	8.81	11	10.00	07	6.36
8 +	M	75	65.69	16	14.03	10	8.77	07	6.14	06	5.26
	F	67	63.21	14	13.20	09	8.49	08	7.55	08	7.55
9 +	M	62	57.41	15	13.89	13	12.04	10	9.36	08	7.41
	F	55	57.89	16	16.84	08	8.42	09	9.47	07	7.36
10 +	M	70	53.84	24	18.46	12	9.23	13	10.00	11	8.46
	F	67	58.77	19	16.66	10	8.77	10	8.77	08	5.56
Total	M =	499		114		79		69		55	
	F =	438		109		66		65		57	
Grant Total		937		223		145		134		112	

Table 9: Skinfold thickness at tricaps (mm), mean and standard effor for Warli boys and girls

S. No.	Boys Mean ± SE	Numbers	Age group	Girls Numbers	Mean ± SE
1	7.63 ± 0.17	116	4 +	111	7.67 ± 0.15
2	7.79 ± 0.14	123	5 +	114	7.74 ± 0.16
3	7.95 ± 0.17	95	6 +	95	7.85 ± 0.16
4	7.89 ± 0.14	122	7 +	110	7.85 ± 0.16
5	7.99 ± 0.16	114	8 +	106	8.11 ± 0.15
6	8.35 ± 0.19	108	9 +	95	8.44 ± 0.17
7	8.50 ± 0.16	120	10 +	114	8.32 ± 0.18

N = Size of sample, SE = Standard Error

Table 10: Mid uppear arm circumference (cm); mean and standard error for Warli boys and girls

S. No.	Boys Mean ± SE	Numbers	Age group	Girls Numbers	Mean ± SE
1	13.52 ± 0.10	116	4 +	111	13.33 ± 0.10
2	13.71 ± 0.08	123	5 +	114	13.52 ± 0.10
3	14.70 ± 0.10	95	6 +	95	14.14 ± 0.11
4	14.64 ± 0.08	122	7 +	110	14.53 ± 0.10
5	14.98 ± 0.09	114	8 +	106	14.97 ± 0.12
6	15.41 ± 0.11	109	9 +	95	15.07 ± 0.16
7	15.65 ± 0.12	130	10 +	114	15.48 ± 0.17

N = Size of sample, SE = Standard Error

Table 11: Distribution of Warli boys and girls, according to mid-upper arm circumference using well-to-do Indian boys and girls standards

Age (in years)	Mid-upper arm circumference classification														
	< 75% = Severe Malnutrition				75-80% = Moderate Malnutrition				80-85% = Mid Malnutrition				> 85 % = Normal			
	Boys		Girls		Boys		Girls		Boys		Girls		Boys		Girls	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
4 +	36	4.5	32	4.3	30	3.7	26	3.5	27	3.3	24	3.2	23	2.8	29	3.9
5 +	34	4.2	29	3.9	38	4.7	34	4.6	35	4.3	26	3.5	19	2.4	20	2.7
6 +	28	3.5	25	3.4	31	3.8	26	3.5	25	3.1	30	4.0	11	1.4	14	1.9
7 +	30	3.7	27	3.6	28	3.5	29	3.9	33	4.1	30	4.0	31	3.8	24	3.2
8 +	29	3.6	30	4.0	24	2.9	26	3.5	3.6	4.5	26	3.5	25	3.1	24	3.2
9 +	25	3.1	21	2.8	37	4.6	30	4.0	35	4.3	27	3.6	33	4.1	17	2.3
10 +	4.33	4.1	30	4.0	39	4.8	26	3.5	20	2.5	26	3.4	38	4.7	32	4.3

them has been limited, is not over-emphasised. When an organism is subject to chronic low caloric intake, there is a continuous and progressive transition from a state of normality to the stage of chemically mainfest malnutrition. The value of nutrients per 100 gms of edible portion

Table 12: Distribution of Warli boys and girls, whose hemoglobin value is below 12 grams per cent

Sex	Hemoglobin below 12 grams per cent							
	<8.0		8.0 - 10.0		10.1 - 11.0		11.1 - 11.9	
	No.	%	No.	%	No.	%	No.	%
Boys	06	0.74	182	22.52	187	23.14	19	2.35
Girls	04	0.53	158	21.20	164	22.01	14	1.87
Total	10	0.63	340	21.82	351	22.58	33	2.11

of some of the food stuffs, some of which make-up diet of Warli children is given in table 13.

As in many of the tribal areas, the Warlis also suffer from the non-availability of safe drinking water, which has further influence on hygienic conditions at personal, family and village level. Food tabooes, incidences of child marriages (average age at marriage of girls is 12 to 13 yrs. and 16 to 18 yrs. for boys); hinderance due to cultural practices, strong beliefs in customs and traditions with respect to the concept of health, disease and treatment patterns etc. have an additive effect on the undernourished status.

Although the warlis are in a transitional stage; the changes are mostly restricted to the soft core of the culture in terms of dress-pattern, hair style, use of automotive vehicles and avoidance of distance walking etc. The effect of the bio-degradation has affected their main occupation (agriculture) and thus they have to supplement by working as labourers of any category. Hence temporary migration is imposed.

The Mid-day School meal programme is a line of hope for nutritional supplementation. The common health problems reported at the PHC as well as with the local doctors reveal that prevalence percentage of respiratory diseases is highest (17%) followed by fevers and malaria (16%) and diarhoea (14%).

DISCUSSION

In many developing countries like India, growth failure or development is the main public health problem. It arises from the complex of nutritional, biological and social deprivation. It

Table 13: Average daily intake of food groups in gms per day among the Warli children of age group 4 to 6 years, 7 to 9 years and 10 to 12 years.

Food items	Approximate among consumed by Warli children in grams/calories Age groups					
	4 to 6 years grams/calories		7 to 9 years grams/calories		10 to 12 years grams/calories	
Rice (boiled)	75	250	100	340	100	340
Nagli/Wheat	75	250	100	340	150	510
suji/Jaggery	100	348	–	–	–	–
Milk power/milk	50	249	–	–	–	–
Pulses : Udid dal, Tur dal. Bengal gram, Mug dal, Pea,	30	100	100	340	100	340
Green leafy vegetable : Methileaves, Palak, Ambat, raddish leaf, onion-leaves, Cabbage	50	90	75	135	100	180
Other vegetables : Potato, Tomato, flower, Brinjal, Pumpkin, Gourd Ladies finger	–	–	50	90	75	135
Flesh food : Fish (Wam, Mackeral) Chicken, Mutton, Egg (occasionally)	–	–	50	50	75	75
Fruits : Guava, Chikoo, Bor, Tamarind, Banana, Papaya Karwan, Lemon Amla, Mango	50	50	100	100	100	100
Fat and Oils/ Ground nut	–	–	20	90	30	135
Salt and Spices Miscellaneous	–	–	10	–	10	–

Table 14 A: The mean intake of Kcal/day of Warli children and the energy requirement for Indian children recommended by ICMR (1990) according to age groups

Age group	Mean intake of Kcal/day Warli	Energy requirement recommended by ICMR Kcal/day	Deficit Kcal/day
4-6	1336	1500	- 164
7-9	1485	1800	- 315
10-11	1815	2190	- 375

14 B: Nutritive value of the foods consumed per day by Warli children

Details	Per unit consumption per day		
	Minimum requirement	Actual consumed	Remarks
Protein (gm)	44.00	38.00	- 06.0
Calcium (gm)	1.00	0.20	- 00.8
iron (mgm)	20.00	16.00	- 04.0
Vit. A (IU)	3000 - 4000	2480.00	- 520.0
Thiamine (mgm)	1.50	1.25	- 00.25
Riboflavin (mgm)	1.80	0.80	- 01.00
niacine (mgm)	15.00	14.00	- 01.00
Vit. C. (mgm)	50.00	40.00	- 10.00

quantitative anthropometric data are clear indicative of two patterns *viz.* the growth standards and nutritional status; which are in fact not mutually exclusive. The outcome, however, can be correlated to the multiple dimensions of individual health, development, socio-economic, and the environmental determinants. Besides they have the potential applications at individual level in emergency and non-emergency situations at population level to know the trends.

Some biological explanation can be found with the formation of new tissues i.e. impaired growth particularly with respect to weight gain or loss for which a) dietary inadequacy b) infections c) regulatory influences and/or d) a combination of all these are the probable causative factors. (WHO1986 a). In considering "underweight" or "overweight", the concepts need not be related to the body size achieved, because of the more (relatively) past environmental influences and energy-balance intake and expendi-

Table 15: Per cent distribution of clinical signs of nutritional deficiencies

Details	Age year													
	4+		5+		6+		7+		8+		9+		10+	
	B	G	B	G	B	G	B	G	B	G	B	G	B	G
	N = 116	N = 111	N = 123	N = 114	N= 95	N = 95	N = 122	N = 110	N = 114	N = 106	N = 108	N = 95	N = 130	N = 114
Protein energy malnurition	18	14	15	13	12	11	14	15	17	11	13	11	10	08
Vitamin-A	05	04	04	03	01	03	04	01	01	02	02	-	02	01
Iron	18	16	17	09	15	13	10	13	08	09	07	04	06	02
Riboflavin deficiency	04	03	08	06	06	02	03	04	02	04	03	-	03	02
Phrenoderma (fatty acid) deficiency	02	-	01	02	01	-	02	03	-	02	01	03	01	01
Nicotiric (niacin) deficiency	04	030	03	02	01	03	02	01	030	05	02	01	04	02
Vitamin C deficiency	02	04	02	-	03	01	03	04	01	02	05	-	02	03
Kwashiorkor	07	03	02	04	02	03	04	02	03	04	02	01	02	01
Total	60	47	52	39	41	36	42	44	35	39	35	20	30	20
Grant Total : 540														

further is related to ill health, wasting and growth retardation resulting in stunting, functional disadvantages and high mortality rates. Anthropometry is an effective and efficient tool to measure and identify such conditions, but it does not identify the causes or the solutions thereby. The

ture. Besides both intake and expenditure is influenced by internal factors such as regulation of intake. Regulation of tissue metabolism and the environmental factors such as food availability or food shortage or food scarcity, physical activities, all types of infections and social

problems. The results of anthropometric indices are relevant for programme management for identifying target group; monitoring progress and in assessing overall programme effect.

In shortage of food, wasting is more highly predictive of risk and the marker MUAC (mid-upper arm circumference) is preferd. In case, length is not available or if the sample is above 5 yr. where the cut-off points are difficult to define the MUAC is cautiously used.

It is well documented that the tissue level gets depleted much before the manifestation of clinical signs. Research evidences indicate that clinical signs related to the deficiency of energy, iron, vitamin-A and the B-complex vitamin are most frequently encountered in the Indian Children (NNMB 1984) and the Warlis are not an exeption to this. The diet of Warli children by and large is monotonous containing mainly Nagli, Rice, few quantities of cereals and pulses. Vegetables, roots, tubers, and leafy vegetables are available only during winter. Flesh foods, dairy products, oils, sweets etc. are luxurious items. In effect, the diet lacks proteins, vitamins, and other vital nutrients.

In general, the indirect factors such as food habits and dietary pattern, occupation, income, education, housing condition, water supply, hygienic conditions, immunization, medical pluralism, concept of health, nutrition and diseases and the aspects of health behaviour are crucial determinants of nutritional profile. The effect of ecological factor also cannot be neglected. Hence gross wasting is the outcome which generally is aggervieated by low economic level.

PROGRAMMATIC IMPLEMENTATIONS OF THE STUDY

The following suggestions can be made in order to improve the nutritional and health status of the children in particular as well as health of the Warli community as a whole.

1. Improving Socio-Economic Status of the Families: Raising their economic status to a higher level can solve the problem of under nutrition to a greater extent. It may be possible by creating employment facilities in agricultural sectors particularly. Nutritional status and poverty cannot be rectified without economic growth, more employment and increase in income for the weaker sections particularly.

2. Safe Drinking Water Facility: The number of bore wells should be increased and chlorination of water in the wells to be undertaken in villages. Monitoring the supply of pure and clean water for each village should be done.

3. Motivation for Immunization: The existing immunization programmes conducted by the health department officials should cover all the remote areas and the impact of immunization programmes should be monitored through camps. Awareness need to be generated to help the village folk to effectively utilized the existing facilities given by the health department.

4. Nutritional Education for Improving the Nutritional Status: Messages relating to nutrition should be integrated in the curricula of literacy campaign and educational programmes targeted at different age groups. Adult education and some training on child health care should be imparted to the tribal mothers.

5. Intervention Programme Through Proper Understanding Tribal Culture: Intervention programmes should be carried out by the government espically to the vulnerable groups like infants, pregnant and lactating mothers. Implementation of nutrition and health education should be done through games and through public media, particularly mothers should be given training with the help of local interpreters.

6. Community Involvement and Participation: The leaders and educated members of the community can be trained as nutritional and health workers to conduct nutritional and health programmes among their own community. Compulsory training should be given to some mothers of each village to take part in he implementation programmes. Also by encouraging and motivating the tribal youth to educate themselves so that the schemes implemented by various government and NGO's are successful.

7. Monitoring and Surveillance: The present study emphasises the integrative approach of direct and indirect parameters including the ecological aspects not only as one time assessment but also for the growth and nutritional monitoring and surveillance from time to time. This could be managed for framing the policy and to make appropriate planning to implement the same

either for short or medium or long term projects depending upon the severity of the problem.

Good health and good society go together. This would be possible only when a number supportive services such as nutrition, improvement in environment and in education go upto a very high level. In fact, anthropological-sociological studies covering different facets of the society are urgently necessary to understand some of the realities of health problems prevailing among the tribal populations.

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