Nutritional Deprivation of children in Rural Kerala
An Inter Caste Analysis

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Abstract—**Nutritional status of children in the age group of 1 to 12 years in four caste groups in the rural areas of kannur district in Kerala was studied using the anthropometric and bio chemical examination techniques. Total of 182 children, of which 88 boys and 94 girls in rural area of Kannur district formed the study group. With measurements of height and weight, and hemoglobin examination, the prevalence of various forms of growth retardation was determined in four caste groups in the rural area namely Scheduled Caste, Scheduled tribe, Other Backward Caste and Others (forward Caste). The tribal and scheduled caste children exhibited poorer nutritional status of stunting, under weight and anaemia mainly because of low nutritional intake, poor nutritional perception and due to the deprivation of basic environmental quality**

Keywords: Anthropometry; Nutritional status, Rural children; Bio-chemical; Deprivation

I. INTRODUCTION

All Human beings are born free and equal in dignity and rights. So beings the universal declaration of Human rights established 60 years ago and celebrated today around the globe. When it comes to nutrition, all of India's children are not equal. According to India's third National Family Health Survey (NFHS -3) of 2005-06, 20 percent of Indian children under five years old are wasted due to acute under nutrition and 48 percent are stunted due to chronic under nutrition Seventy percent of children between six months to 59 months are anaemic. Despite booming economy, nutrition deprivation among Indian children remains widespread. Though this is the average of the country as a whole, when we turn to the caste and community wise data separately it can be seen that the picture is alarming in the sense that the case of scheduled caste and scheduled tribe children are very pathetic and deplorable. The present study is an attempt in this direction to examine the nutritional vulnerability of children in different caste group especially in the rural cluster level. . In order to explore the possibility that the extent of childhood malnutrition that could vary among different caste and social groups living in different socio economic and environmental background, a study was undertaken among households in the rural areas of Kannur District in Kerala State in India.

II. BACKGROUND

The achievements of Kerala in the field of health have not been uniform across all sections of society. There is no reliable data regarding the differentials of nutritional status across socio-economic classes in Kerala. Hemoglobin values, rather than prevalence of anemia in different classes, along with anthropometry would be the ideal measure for this. Though the Health indicators of Kerala are higher, compared to other states in India, the situation of nutrition in critical sectors and areas of population does not portray a rosy picture. There is widespread prevalence of Malnutrition in the form of Underweight, Low Birth Weight, Wasting, Stunting, Anemia, and other manifestations of micro- nutrient deficiencies among different age groups of the population as a whole. Though Kerala is successfully implementing all nutrition oriented programmes and related programmes of housing, sanitation and potable drinking water, the state could not achieve the nutritional level of best performing countries. It is estimated that children under 6 years of age form about 11.48% of Kerala population and the below 14 age group form 27.3%. The state average of IMR is 15. In spite of the State having the best indicators of Women and Child Development, certain disturbing trends have emerged in recent years affecting this developmental status, especially in the child population. This includes low birth weight in babies, stunting of growth, and wasting, low weight for age, poor maternal nutritional status, prevalence of anaemia among women and adolescent girls. Any further reduction in IMR is impossible without a reduction of LBW in babies, as most of the deaths take place within one to 28 days. Ensuring Child Survival means elimination of LBW. Low birth weight, constituting 17.6% of population, is directly related to maternal nutritional status and statistics show that 50 to 55% of women (Pregnant and Lactating) are anaemic. The prevalence of Anaemia among children under 3 years is 33.7%. The data presented by National Nutrition Monitoring Bureau (NNMB) in 2002, shows that 40.79% of children are underweight, 30% stunted and 33.8% wasted. The prevalence of nutritional deficiency Goitre is recorded as 4.5%. Anaemia among Adolescent girls is a staggering 23%. Vitamin A deficiency in the form of Conjunctival Xerosis also exists in about 0.1 % of population. Though under nutrition can occur at any age, the main victims are children.

Marasmus and keratomalacia which used to be a major public health problem till 1960's have declined now. However population at large is affected by hidden under nutrition which may not be easy to diagnose (Srilakshmi 2006)

III. OBJECTIVES.

- To examine how social and caste factors influence in the nutritional deprivation of children
- To compare and contrast the extent of nutritional deprivation among children in the age group of 1 to 12 years in four caste group in rural segment of Kerala.
- To suggest the possible interventions to mitigate nutritional deprivation among children.

IV. METHODOLOGY

The study is the outcome of household level data collected with respect to the nutritional status of children in the age group of 1 to 12 years in the rural areas of kannur District in Kerala. The Kannur district is one of the northern district in Kerala identified for low socio-economic development especially of the marginal and deprived sections. The kannur district consists of 9 Revenue Blocks. Out of the 9 Blocks 3 Block have been identified (i.e Iritty, Kannur and Peravoor) for the survey on the basis of availability and existence of dominant caste group in Kerala including SC,ST,OBC, and Others. From each block 1 panchayath each have been identified (i.e Aralam Panchayath from Iritty Block, Puzathi Panchayath from Kannur Block and Kolayad Panchayath from Peravoor Block). Then two wards from these 3 panchayath have been selected at random by considering the representation of the entire caste group. As part of the filed survey at the outset, the entire households in each of these 6 wards in three panchayath have been listed separately by ward wise on the castes in which they belong (i.e four caste group namely SC, ST, OBC and Others. Then 100 households each from four caste group have been selected from these 6 wards of three panchayath on the basis of population proportion to size method so as to form a total sample size of 400 households. The four hundred household consist of 182 children (88 males and 94 females) in the age group 1 to 12 years and they have been selected for the analysis of nutritional deprivation. The occupation of the people differed from one caste group to the other and the predominant occupation of tribal and scheduled caste household was casual labour. Children in the age group of 1 to 12 years in the selected households were studied

by measuring the height, weight, head and mid arm circumferences. Weight measurements were taken in a portable platform weighing balance. The scale was adjusted to zero before each measurement. The subjects were having minimum clothing and were asked to stand on the platform of the scale without touching anything and looking straight ahead. Weight was recorded to the nearest 0.25 kg. Daily standardization was done with a known weight. Height was measured using a measuring tape fixed vertically on a smooth wall perpendicular to the ground, taking care to see that the floor area is even and not rough. Each child identified for measuring height was asked to remove the shoes, stand with the centre of his back touching the scale, with his feet parallel, heels, buttocks, shoulder and back of the head touching the wall. The head was held comfortably erect. The arms hung loosely by the side. A smooth thin ruler was held on top of the head in the centre, crushing the hair at right angle to the scale and the height read off from the lower edge of the mauler to the nearest 0.5 cm. Each reading was taken twice to ensure correctness of the measurement and to minimize intrapersonal errors. For children below two years, a recumbent length was measured using infantometer. All these measurements were recorded by the same person, thus minimizing the interpersonal errors.

V. DISCUSSION AND RESULTS

Nutrition anthropometry has been defined as the measurement of variations in physical dimensions and the gross composition of human body at different age levels and degrees of nutrition (Jelliffe1996) Physical dimensions of the human body are very much influenced by

- Biological factors (sex, intra uterine, environment, birth order birth weight parental size etc.)
- Genetic back ground
- Environmental factors ((season, climate, socio economics, nutrition, exposures to infections, infections) and
- Psychological   factors

TABLE I. MEAN ANTHROPOMETRIC MEASUREMENT IN DIFFERENT AGE GROUP

Scheduled Caste							
Age group	*Sex*	*No*	*Weight ±*	*Height ±*	*BMI*	*Head Arm Circumferences*	*Upper Arm Circumferences*
1-6	Male	3	10.83±2.75	0.91±0.11	12.96±0.81	47.33±3.52	15.0±0.0
	Female	4	10.25±1.89	0.91±0.06	12.28±0.49	45.25±2.21	15.75±0.50
6-12	Male	17	24.59±5.85	1.28±0.77	14.77±2.46	51.94±1.95	19.51±2.28
	Female	15	23.40±6.20	1.27±0.12	14.11±2.26	49.20±8.48	18.53±2.26
Scheduled Tribes							
1-6	Male	10	17.90±2.96	1.03±0.10	16.86±2.55	48.80±1.61	16.0±1.63
	Female	10	16.0±1.49	0.98±0.94	16.67±3.07	46.40±1.77	16.±1.68
6-12	Male	29	26.03±5.45	1.29±0.11	15.36±2.06	49.55±4.05	17.45±1.76
	Female	28	23.11±6.56	1.21±0.15	15.38±1.54	49.36±1.90	17.25±1.95
OBC							
1-6	Male	4	15.50±2.38	1.08±0.47	13.09±0.84	51±0.81	17.50±1.73
	Female	5	17±4.69	1.08±0.10	14.27±1.81	50±1.22	17.80±2.77
6-12	Male	12	27.25±7.00	1.33±0.13	15.15±1.54	51.58±1.67	27.25±1.67
	Female	10	28..10±8.85	1.30±0.11	16.23±3.30	49.50±2.24	19.20±3.30
Others							
1-6	Male	5	17.80±2.38	1.08±0.57	15.08±0.73	49.80±1.09	16.80±0.83
	Female	10	19.4±4.24	1.11±0.10	15.38±1.65	49.10±2.55	16.20±1.87
6-12	Male	8	26.25±8.79	1.28±0.14	15.44±1.53	50.88±1.64	16.62±2.13
	Female	12	24.92±4.58	1.24±0.11	16.30±3.97	50.33±1.30	18.25±1.54

Source: Field survey

Anthropometric measurements like weight and height were recorded for all of the children in the age group 1-12 years .similarly head circumferences and upper arm circumferences were also measured. To realize the depthness of malnutrition the hemoglobin level of children in the age group of 1-12 years were also measured with the support of medical staff. Above all to see the extent and variety of nutritional deprivation of children, the clinical symptoms of malnutrition was also identified with the support of medical practitioners. Thus a package scheme was devised to measure the depthness of malnutrition among the

TABLE II. WEIGHT FOR AGE OF CHILDREN IN THE AGE GROUP OF 1-6 YEARS

Caste	Male				Female			
	Normal	*Moderate*	*Severe*	*Total*	*Normal*	*Moderate*	*Severe*	*Total*
SC	1(25)	2(50)	1(25)	4(100)	2(50)	1(25)	1(25)	4(100)
ST	5(55.6)	2(22.2)	2(22.2)	9(100)	6(60)	1(10)	3(30)	10(100)
OBC	4(100)			4(100)	4(80)	1(20)		5(100)
Others	5(100)			5(100)	9(90)	1(10)		10(100)
Total	15(68.2)	4(18.2)	3(13.6)	22(100)	21(72.4)	4(13.8)	4(13.8)	29(100)

Source: Field survey

children in the age group of 1-12 years among different caste group. The table I shows the mean value of Height, Weight BMI Head Arm Circumferences and Upper Arm circumferences. From the mean value it is observed that SC and ST children in the age group of 1 -6 and 6-12 years are lagging far below in the mean values of all the main anthropometric indicators like height, weight, body mass index, head arm circumferences, upper arm circumferences compared to OBC and Other Caste groups revealing the facts that the nutritional plight of children in the marginalized communities are very deplorable. The problem of chronic energy malnutrition is severe among the children in the age group of 1-6 in the marginalized groups (Table II). It is seen that 25 percentage of males and 25 percentage of females in SCs and 22.2 percentage of males and 30 percentage of females in STs communities are in severely malnourished. In SCs 50 percentage of males and 25 percentage of females are in moderate malnourished category. On the other hand in STs 22.2 percentage of males and 10 percentages of females are moderate under nourished children. All other caste group are free from the nutritional problem of chronic energy deficiency or weight for age.

TABLE III. WEIGHT FOR AGE OF CHILDREN IN THE AGE GROUP OF 6-12 YEARS

Caste	Male				Female			
	Normal	*Moderate*	*Severe*	*Total*	*Normal*	*Moderate*	*Severe*	*Total*
SC	9(52.9)	7(41.2)	19(5.9)	17(100)	7(46.7)	6(40)	2(13.3)	15(100)
ST	17(58.6)	9(31)	3(10.3)	29(100)	9(32.1)	14(50)	5(17.9)	28(100)
OBC	9(75)	2(16.7)	1(8.3)	12(100)	9(90)	1(10)		10(100)
Others	4(50)	4(50)		8(100)	7(59.3)	5(41.7)		12(100)

Total	39(59.1)	22(33.3)	5(7.6)	66(100)	32(49.2)	26(40)	7(10.8)	65(100)

Source: Field survey

The problem of malnutrition or chronic energy deficiency malnutrition reflecting through weight for age reveals that the problem is severe among the marginalized communities especially among the SCs and STs. It is seen that 17.9 percentage of females and 10.3 percentages of males in ST category and 5.9 percentage male and 13.3 percentage of females in SC category were the victims of severe malnutrition (Table III). In the SC communities 41.2 percentages of males and 40 percentages of females are SCs and similarly31 percentage of males and 50 percentages of females in STs are in moderate malnourished category. The problem of chronic malnutrition is comparatively very less among the OBCs and Other castes groups reflecting better nutritional intake and at the same time suggesting an urgent need for devising a nutritional package for the nutritional empowerment of marginalized groups in the category

TABLE IV.   HEIGHT FOR AGE OF CHILDREN IN THE AGE GROUP OF 1-6 YEARS

Caste	Male				Female			
	Normal	Moderate	Severe	Total	Normal	Moderate	Severe	Total
SC	1(25)	2(50)	1(25)	4(100)	1(25)	2(50)	1(25)	4(100)
ST	6(66.7)	1(11.1)	2(22.2)	9(100)	5(50)	1(10)	4(40)	10(100)
OBC	4(100)			4(100)	4(80)	1(20)		5(100)
Others	5(100)			5(100)	8(80)	2(20)		10(100)
Total	16(72.7)	3(13.6)	3(13.6)	22(100)	18(62.1)	6(20.7)	5(17.2)	29(100)

a. Normal median to >-1, moderate   median <-2, Severe median <-3

Source: Field survey

The stunting data for the age group 1 to 6 reveals that (table IV) both females and males are the victim of malnutrition. It seen that 25 percentage of males and females in the SC household are in the category of severe stunting or the height for weight. Another thing to be noted here is that in the ST households 22.2 percent of males and 40 percentage of females are also in the severe category of malnutrition. But in OBCs and Other caste groups there is absence of malnutrition. The table shows that 50 percentages of SC males and 50 percentage of females are under the moderate category. In ST Communities 11.1 percentage of males and 10 percentages of females are under moderate category

TABLE V.   HEIGHT FOR AGE OF CHILDREN IN THE AGE GROUP OF 6-12 YEARS

Caste	Male				Female			
	Normal	Moderate	Severe	Total	Normal	Moderate	Severe	Total
SC	13(76.5)	3(17.6)	1(5.9)	17(100)	11(73.3)	3(20)	1(6.7)	15(100)
ST	19(65.5)	7(24.1)	3(10.3)	29(100)	10(35.7)	10(35.7)	8(28.6)	28(100)
OBC	12(100)			12(100)	8(80)	2(20)		10(100)
Others	6(75)	2(25)		8(100)	8(66.7)	4(33.3)		12(100)
Total	50(75.8)	12(18.2)	4(6.1)	66(100)	37(37)	19(19)	9(13.8)	65(100)

Source: Field survey

Stunting as a symptom of malnutrition among the children in the age group of 6-12 reveals that females are the main victim of stunted growth that too among SC and ST communities (Table V). As the field data shows that among the females 28.6 percentage are in the severe category of stunted growth and 35.7 percentage are having mild nutrition among STs. whereas the severe stunted problem was absent among OBCs and Other caste groups. Severe stunting problem among the males in SCs and STs Communities are lower than females which reveals the gender dimension of nutritional deprivation. The data shows that 10.3 percentages of males in the STs and 5.9 percentages of males in SCs are in the severe stunting category whereas the female counterparts are respectively at years a higher rate of 28.6 prcentage and 6.7 percentage.   The analysis reveals that moderate problem of stunting and the gender dimension of both moderate and severe stunting is high among the marginalized communities.

Bio chemical examination of nutritional status is a more objective and precise approach than dietary/clinical assessment methods. Hemoglobin level is reliable index of the over all state of nutrition. In the present study the help of health and para medical staff was utilized for estimation of hemoglobin level of blood and hemoglobin level was estimated using cyanment hemoglobin method outlined by National Institute of Nutrition (1983) .It was done for children in theagegroupof1-12

TABLE VI.   NO OF CHILDREN IN THE BELOW NORMAL HEMOGLOBIN LEVEL (1 TO 6 YEARS AGE GROUP)

Community	Below Normal(Anaemic)	Normal	Total
SC	0	8(100)	8
ST	6(46.15)	13(58.85)	19
OBC	0	9(100)	9

Others	4(26.7)	11(73.3)	15
Total	10(19.6)	41(79.34)	51

Percentages shown in brackets

TABLE VII.   NO OF CHILDREN IN THE BELOW NORMAL HEMOGLOBIN LEVEL (6-12 YEARS AGE GROUP)

Community	Below Normal (Anaemia)	Normal	Total
SC	13(40.62)	19(59.38)	32
ST	38(66.7)	19(33.3)	57
OBC	7(31.8)	15(69.19)	22
Others	5(25)	15(75)	20
Total	63(48)	68(52)	131

Percentages shown in brackets

The procedure followed in checking the hemoglobin is as follows. 5 ml of Drabkins reagent and that add to 20 micro ml of blood. Mix well and allow standing at room temperature for 5 Minutes completion for reaction. The co lour formed is then compared with the standard and BELOW WHICH

reagent in a calorimeter at 540 nanometer.Calculation: hemoglobin concentration in given

$$\text{perdeciliter} = \frac{\text{optical density of test}}{\text{optical density of standard}} \times 15$$

TABLEIX HEMOGLOBIN CONCENTRATION

TABLE VIII.   NORMAL VALUES OF HEMOGLOBIN

1-2years	9.0-14.6 g/dl
3-9 years	9.4 to 15.5 g/dl
10 years	10.7- 155 g/dl
11-15 years	13.4 g/dl

ANAEMIA IS PRSENT

Childre n	Age	Hemoglobin g/dl(normal)
	6 months to 6 years	11
	6 years to 14 years	12

The classification of anaemia was actually based on the WHO formula developed for measuring haemoglobin concentration (Lewis et al 2006)) the standards below which anaemia is likely to be present have been put by by WHO and it as follows .As per the WHO standard referred above it is seen that in the age group of 1-6 years the anemia problem is severe among STs as 46.15 percentage (Table VI) children are anemic followed by bother categories. In the case of children in the age group of 6-12 years also 66.7 percentage STs hemoglobin level are below normal (TableVII)) standard fixed by WHO or they are anemic in health. Similarly the SCs are also affected badly the hemoglobin concentration or anemia problem. The analysis revealed that the severity of anemia was very high among STs and its gender dimension also reveals that females are the victim of anemia or deprivation of minimum nutritional requirements. The low hemoglobin level in the SC s and STs might be due to inadequate consumption of green leafy vegetables, foods and other vegetables with rich iron content. The studies by Easwaran et.al.(1970), Easwaran and Devadas(1984) also reported very low values of hemoglobin among children below the age of ten. Chandrasekhar et.al(1997) also found mean hemoglobin level below the WHO standard in all age group individuals in the Oraon families studies except for the girls of 16 to 18 years who exhibited normal
Source: WHO technical report, series no 503, 1972 hemoglobin level.

VI. CONCLUSION

Malnutrition is highly prevalent among the poor communities in our country. The extent and severity of malnutrition, however, differ in various States and communities. Kerala has done exceedingly well in reducing

the infant and child mortality; the infant mortality is estimated to be 27 against the all India average of 95, while mortality in children 1-4 year old is only 8/1000, against the all India figure of 24/1000. Though Kerala stands little ahead of other stats in India in health and maternal child health development, the nutritional indicators connected with under nutrition and underweight etc are very high especially among the marginalized communities. The present study is an attempt in this direction and the results shows that the nutritional status of children belongs to the marginalized communities like SCs and STs are very deplorable compared to the OBC and Other Caste groups in Kerala. A comparison of severity of malnutrition among boys and girls according to the Gomez criteria (Jellife, 1966a) reveal that in SC and STs, where malnutrition is worst, there is a high deference in the degree and severity of malnutrition between boys and girls, while in the OBC and Other Caste groups there is initially a slight but insignificant difference in the proportion nutritional deprivation between boys and girls. However, when the proportion of children stunted and wasted is taken into consideration, there is a slight increase among girls in the age group of 6 to 12. The study results corroborate the general assumption that malnutrition and mortality tend to be higher among the girls (ICMR, 1984) consequent up on a conscious gender discrimination against girls especially in higher age groups. It may also be concluded that the females are more chronic energy deficient than males among these caste groups probably due to significantly lower quantity of nutrient intake by females than their male counterparts. Protein energy malnutrition and anemia are the common nutritional deficiency among vulnerable communities in the rural areasof Kerala. This may be due to cereal based and inadequate diet of scheduled caste

and scheduled tribe families and they eat to fill the stomach. Their diet lacks body building and protective foods. They take food just for survival which may be compulsion of their socio economic environment. The intake of most of the foods and also all nutrients are comparatively low in the diets of females than males. So female members seem to be deprived of adequate food and nutrient intake vis-à-vis their male counterparts. Economic variables like income also found influencing significantly at the nutritional status of marginalized communities. Thus economic factor is also significant for improving the nutritional status of vulnerable communities and caste groups in the society. Some strategies are important for improving the nutritional status of children belongs to vulnerable caste and community groups. They include adequate nutrition and support for adolescent girls to prevent anemia, therapeutic feeding for children with severe acute malnutrition, immunization and bi-annual vitamin A supplementation with deworming, age appropriate foods for children with six months to 5 years. In addition there is also the need for specific strategies for physical access to food materials, strategies for economic access to food materials and also some facilitating strategies to attain all these in a time bound manner in their life cycle especially in tune with the growth chart of children. Hence it is summarized that the nutritional deprivation of marginalized communities is mainly due to poor socioeconomic environment, poor dietary behaviour and poor nutritional perception.

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