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Assessment of Nutritional Status Among The Khaire Kunbi Children of Maharashtra

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INTRODUCTION

India has the dubious distinction of having the largest number of malnourished children in the world. The attainment by all the people of the highest level of health is the goal of the WHO. Assessment of nutritional status is a vast subject (WHO 1995, 1999). According to Jelliffe (1966) the study of nutritional status of any country is important form the mechanism of evolution and morphological character which bring about the change in the pattern of body development and its structure.

Malnutrition has been defined as a "pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients"(Jelliffe,1966). Malnutrition during infancy and early childhood is believed to have long- term repercussions on both physical growth and intellectual performance in later life (Stoch and Smythe,1967; Srikantia and Sastry, 1972; Cravioto and De Liecardy,1979). The body mass index (BMI), weight deficit, height deficit, Pelidisi index and Korperfulla index are the best determinants of the nutritional status of individual and population. BMI is better indicator of current nutritional status than any measurement or index (Waterlow, 1973; Rao and Singh, 1970; Rao and Rao, 1975; Rao, 1976, 1980; Dudgale, 1971). BMI ratio is also found to be reliable index for assessing malnutrition in growing children (Gupta et al., 1979, 1981; Raman et al.,1989).

The aforesaid indices are influenced by nutrition but highly interacted by genetic material though the interaction of polygenic is a complex phenomenon. The present study has been carried out on the Khaire kunbi an agrarian ethnic community and rice eating area of Vidarbha region in central India with a special interest as no study is available on the aforesaid determinants. The present study is restricted to most interior rural area of extreme eastern Maharashtra with a view to understanding their nutritional status.

PEOPLE

The Khaire kunbi are endogamous and the marriage among them is regulated by the rule of *gotra* (clan) exogamy. The Kunbi have four clans namely, Khaire, Tirole, Manwa and Dhanoje of which the Khaire are dominated in Mul and Gondpipri block of Chandrapur district in Vidarbha region from where the data has been collected. They are occupied in small scale agriculture and landless labourers. Some of them are engaged in small business. Very few of them are in government jobs. Literacy level is very low among them (Census of India,1991). They form patrilineal and patrilocal society. Dowry is permissible and allow widow remarriage. Their socio-economic status is relatively low. Many of them are dailywage workers, some of them are domestic servants.

MATERIAL AND METHODS

Anthropometric measurements were taken on 1029 school going unrelated children (517 males and 512 females) from the age 6+ to 16+ years. Simple random sampling design was adhered to in drawing the sample from the children of the Khaire kunbi, an other backward caste of Hindu social structure in Maharashtra state. The selection of the subject was confined to rural areas of three blocks of Chandrapur district in order to obtain children inhabiting in same area having similar dietary habits and socio-economic condition.

Height, sitting height and weight of the children were measured following the standard procedure (Martin and Saller,1957 and Singh and Bhasin,1968). Height and sitting height of the children were measured to the nearest millimeter while weight was measured to the nearest of 0.5kg by using lever scale. The data have been analysed using the Micro Soft Excel software.

The Khaire kunbi belongs to other backward caste category. Majority of them on which the

study is based, are marginal farmers and landless labourers inhabiting in dry and hot climatic region of plain area of Chandrapur district which is much backward from development point of view. Most of the parents of the children are illiterate. Only normal children who were better off are included in the study. The exact date of birth of subjects has been recorded from school record and was cross- checked from birth certificates and parents.

RESULTS AND DISSCUSSION

Body Mass Index (BMI): The distribution of BMI and its categories resulting chronic energy deficiency (CED) is shown in table1. The BMI ranges from 10.35 to 35.43 in males and 10.35 to 24.34 in females. Mean BMI of 14.17 ± 1.53 in males and 14.70 ± 2.06 in females was recorded suggesting a somewhat similar pattern of distribution in both sexes (t = 4.69). The Pearson's coefficient correlation (r) was estimated between age and individual BMI and found to be significant at 1% level (r = 0.71 in both sexes) therefore suggesting that the individuals BMI is strongly related with his/ her age.

The magnitude of increase in BMI with change of age is much larger between 12 + and 16 + years among the females. This is probably due to menarcheal age associated with better over all growth in females during this period (Vishweswar Rao et al., 1991). From figure 1 it is apparent that the curve for female shows higher from 10 + years onward compared to their male counterparts which suggest that the attainment of puberty among females is earlier than in males. There may be changes in both the morphology and genetic component variances with age, however these effects could not be tested in the present study. It is evident from the consistent literature that the ethnic effects on the variability in BMI are robust across several ages.

In India Naidu and Rao (1994) reported that mean BMI values were lower in landless agricultural labourers and in other low-income groups. Bharati (1989) reported a positive association between body dimensions and socio-economic status in southern West Bengal. The present study belonging to the children of marginal agricultural and landless labourers resembles Naidu and Rao's finding.

From table 1 it appears that there was increasing trend in the proportion of individuals towards normal and decreasing trend of CED from lower to higher age groups. A very high frequency of CED-III was recorded in both sexes (56.87 % among males and 49.80 % among females) followed by CED-II. The distribution of CED portrays variation for different grades of malnutrition among the children (81.92 %). However the frequency of CED was found to be higher up to the age group of 13 years in both the sexes, suggesting the most vulnerable period for malnutrition.

Age (in yrs)	*Boys*	*Girls*
6	12.79	12.62
7	12.72	12.55
8	12.74	12.95
9	13.23	13.03
10	13.27	13.45
11	13.42	13.86
12	13.97	15.22
13	15.14	15.89
14	15.72	16.46
15	15.95	17.52
16	17.05	18.23

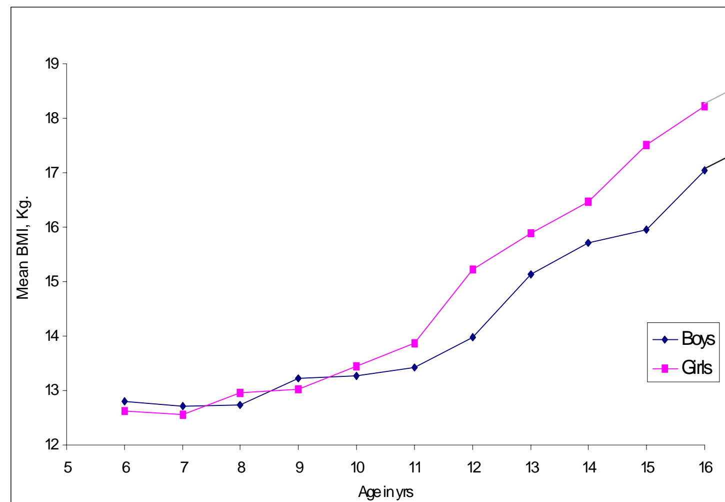

Fig. 1. Graphical representation of mean BMI among the children

Table 1: Age-wise distribution of mean BMI among the children

Age (in yrs.)	Sample size	Category / Grade <14 CED-III	14-15.49 CED-II	15.5-16.49 CED-I	16.5-22.49 Normal	22.5&above Obesity
Boys						
6	59	52(10.06)	4(0.77)	2(0.39)	1(0.19)	-
7	47	41(7.93)	6(1.16)	-	-	-
8	40	38(7.35)	2(0.39)	-	-	-
9	49	39(7.54)	9(1.74)	1(0.19)	-	-
10	45	36(6.96)	9(1.74)	-	-	-
11	43	32(6.19)	9(1.74)	2(0.39)	-	-
12	44	24(4.64)	18(3.48)	1(0.19)	1(0.19)	-
13	46	16(3.10)	21(4.06)	3(0.58)	5(0.97)	1(0.19)
14	44	7(1.35)	10(1.93)	16(3.10)	11(2.13)	-
15	48	7(1.35)	16(3.10)	11(2.13)	14(2.71)	-
16	52	2(0.39)	6(1.16)	12(2.32)	32(6.19)	-
Total	517	294(56.87)	110(21.27)	48(9.28)	64(12.38)	1(0.19)
Girls						
6	49	43(8.40)	6(1.17)	-	-	-
7	51	46(8.98)	4(0.78)	1(0.19)	-	-
8	50	44(8.59)	6(1.17)	-	-	-
9	45	37(7.22)	8(1.56)	-	-	-
10	44	33(6.44)	10(1.95)	1(0.19)	-	-
11	44	27(5.27)	14(2.73)	2(0.39)	1(0.19)	-
12	40	11(2.15)	11(2.15)	8(1.56)	10(1.95)	-
13	46	10(1.95)	9(1.76)	12(2.34)	15(2.93)	-
14	50	3(0.59)	10(1.95)	11(2.15)	26(5.08)	-
15	49	-	7(1.37)	7(1.37)	35(6.83)	-
16	44	1(0.19)	3(0.58)	5(0.98)	34(6.64)	1(0.19)
Total	512	255(49.80)	88(17.19)	47(9.18)	121(23.63)	1(0.19)

** Figures in parentheses shown in percentage.

The Lushai tribal children of Mizoram were lean and thin and majority of them (97.79 %) suffered from chronic energy deficiency. However, 83.03 % of both sexes suffered from CED-III alone (Urade and Mukherjee, 2000). The mean BMI is found to be much lower among the Oraon children of Nazat in West Bengal (Barua et al. 2000). Barua and Mallick (2002) reported similar trend among the Khandayat children of Orissa stating that the mean BMI is much lower among them. Devi and Bhattacharyya (2000) observed a very high frequency (82.8%) of malnutrition among the Anglo Indian children of Calcutta while 56.6% of both the children were found to be under CED-III. Devi and Bhattacharyya (2002) reported that majority of the Poundrakshatriya children (99.27%) of South 24 Parganas suffered from various grades of malnutrition. They further pointed out that about 78.8 % of both the children suffer from CED-III grade of malnutrition alone.

The CED is a chronic imbalance between energy intake and expenditure (Jequier, 1987). The high level of energy expenditure is required for physical activities and playing. This impact of imbalance is seen on both sexes. Since BMI is a result of complex interaction between nutritional intake, health status and physical activity pattern (Parizkova, 1977), the lesser intake of fat and protein might be affected in gaining weight and height among the Khaire kunbi children which attributed to their low socio-economic status.

This shows the magnitude and severity of CED a great problem to be tackled seriously. In rural areas, the chronic energy deficiency is a primary significance rather than overweight.

Weight for Age: From table 2 it appears that majority of the children suffers from grade-II type of malnutrition (23.91%in male and 17.98%in females) followed by grade-I and grade-III.

Table 2: Age-wise weight deficit classification among the children

Age in yrs	Sample	*Categories of malnutrition*					
		50% grade IV	*51-60% grade III*	*61-70% grade II*	*71-80% grade I*	*81% Normal*	*Obesity*
Boys							
6	59	-	14(1.36)	38(3.69)	6(0.58)	1(0.1)	-
7	47	2(0.19)	12(1.17)	27(2.62)	5(0.49)	1(0.1)	-
8	40	-	4(0.39)	32(3.11)	4(0.39)	-	-
9	49	2(0.19)	11(1.07)	18(1.74)	16(1.56)	2(0.19)	-
10	45	-	5(0.49)	25(2.83)	14(1.36)	1(0.09)	-
11	43	1(0.1)	9(0.87)	21(2.04)	8(0.78)	4(0.39)	-
12	44	1(0.1)	12(1.07)	22(2.14)	7(0.68)	2(0.19)	-
13	46	3(0.29)	15(1.46)	16(1.56)	7(0.68)	3(0.29)	2(0.19)
14	44	-	8(0.78)	16(1.56)	11(1.07)	9(0.87)	-
15	48	3(0.29)	7(0.68)	17(1.65)	14(1.36)	5(0.48)	2(0.19)
16	52	-	4(0.39)	14(1.36)	16(1.56)	18(1.75)	-
Total	517	12(1.17)	101(9.82)	246(23.91)	108(10.5)	46(4.47)	4(0.39)
Girls							
6	49	-	6(0.58)	19(1.85)	23(2.24)	1(0.1)	-
7	51	1(0.1)	12(1.17)	28(2.72)	8(0.78)	2(0.19)	-
8	50	1(0.1)	7(0.68)	27(2.62)	14(1.36)	1(0.1)	-
9	45	1(0.1)	13(1.26)	21(2.04)	5(0.48)	5(0.48)	-
10	44	3(0.29)	9(0.87)	21(2.04)	11(1.07)	_	-
11	44	-	14(1.36)	22(2.14)	6(0.58)	2(0.19)	-
12	40	2(0.19)	9(0.87)	15(1.46)	10(0.97)	4(0.39)	-
13	46	1(0.1)	12(1.17)	10(0.97)	12(1.17)	10(0.97)	1(0.1)
14	50	-	4(0.39)	12(1.17)	12(1.17)	21(2.04)	1(0.1)
15	49	-	1(0.1)	4(0.39)	16(1.56)	24(2.33)	4(0.39)
16	44	-	1(0.1)	6(0.58)	18(1.75)	18(1.75)	1(0.1)
Total	512	9(0.87)	88(8.55)	185(17.98)	135(13.12)	88(8.55)	7(0.68)

**Figures in parentheses shown in percentage.

Obesity was found to be negligible in both sexes. A quite low frequency of normal category in both sexes was recorded. The males (45.30%) were found to be more sufferer than the female (40.6%) this indicate that chronic malnutrition has a sever impact on body tissue of growing children resulting into lower weight of age. Thus the wasting is more common up to the age of 13+ years in male and 12+ years in female.

The low weight for age indicates loss of body tissue due to malnutrition. The relatively higher tendency of malnutrition was found to be prevalent in lower age than that of higher once. This means that wasting is more common during prepubertal period may be because of physical activities and other internal metabolic activities are highly responsible than pubertal and adolescent period of the growing children.

Urade and Mukherjee (2000) reported that the extent of malnutrition was higher among the male children than that of female counterparts of the Lushai tribal group. However, 38.08% of the total children were suffered from weight deficit. Barua and Mallick (2002) observed that 81.08% of the Khandayat children suffered from different categories of malnutrition. A moderate frequency of 26% of the Oraon children falls under malnourished group (Barua et al., 2000). Devi and Bhattacharyya (2000) found a very high frequency of (75.68%) malnourished children belonging to the Poundrakshatriya community of West Bengal. They also reported that the Anglo Indian children of Calcutta suffered less (22.4%) than that of the Poundrakshatriya.

Wasting indicates a deficit in tissue and fat mass (WHO, 1986). Thus the present study is in conformity with this stating that due to lack of nutritious food the growing children are not able to accumulate tissue and fat, this is mainly because of non-consumption of adequate food.

Table 3: Age-wise height deficit classification among the children

Age (in yrs.)	Sample	Categories 80% poor	81-90% mild-retardation	91-100% normal
Boys				
6	59	-	39(3.79)	20(1.94)
7	49	-	28(2.72)	19(1.85)
8	40	-	19(1.85)	21(2.04)
9	49	-	20(1.94)	29(2.82)
10	45	-	20(1.94)	25(2.43)
11	43	-	18(1.75)	25(2.43)
12	44	1(0.1)	23(2.24)	20(1.94)
13	46	3(0.29)	28(2.72)	15(1.46)
14	44	-	25(2.43)	19(1.85)
15	48	1(0.1)	20(1.94)	27(2.62)
16	52	_	19(1.85)	33(3.21)
Total	517	5(0.49)	259(25.17)	253(24.59)
Girls				
6	49	-	25(2.43)	24(2.33)
7	51	-	32(3.11)	19(1.85)
8	50	-	19(1.85)	31(3.01)
9	45	-	15(1.46)	30(2.92)
10	44	-	21(2.04)	23(2.23)
11	44	2(0.19)	26(2.53)	16(1.56)
12	40	1(0.1)	20(1.94)	19(1.85)
13	46	-	18(1.75)	28(2.72)
14	50	1(0.1)	11(1.07)	38(3.70)
15	49	-	6(0.58)	43(4.18)
16	44	-	2(0.19)	42(4.08)
Total	512	4(0.39)	195(18.95)	313(30.42)

** Figures in parentheses shown in percentage.

Height for Age: The table 3 reveals that 44.12% (25.17% males and 18.95% females) of both the children were found mildly retarded. The early childhood (6 - 7years) period and pubertal period (12 –14 years) seems to be more vulnerable for height deficit as evident from the present study while among the female it was seen during 11-12 years. This means that the stunting is more common during this period. Conversely normal height among males was found during 15-16 years while that of females it was recorded during 13-16 years, since adolescent period starts earlier in females as evident from the present study. The increase in height relatively takes more time than gain in weight. Longer duration of chronic malnutrition has greater impact of stunting the height where as it has comparatively lesser impact on wasting the weight of growing children. This finding is in accordance with earlier studies (Bhattacharya, 2000).

The male children of the Lushai tribal group were more under mild retardation than their female counterparts *ie* the stunting is higher in males than in the females may be due to consumption of more energy by the males as they do more physical activities compared to females (Jequier, 1987). A high frequency of mild retardation was seen in both sexes (Barua and Mallick, 2002). The Oraon children of Orissa, however, show very low frequency of malnutrition (Barua et al., 2000). Anglo-Indian children of West Bengal resemble the Oraon children in this regard (Devi and Bhattacharyya, 2002). But they observed very high frequency of malnutrition in the Poundrakshatriya (78.54%).

Korperfulla Index: The table 4 portrays the highest frequency (80.66%) of children suffers from low state of malnutrition (43.34% males 37.32% females). Only 18.46% of the children were found to be under normal category. When compared it was noticed that the male suffered more than the females. A quite remarkable difference was noticed between males and females where female shows increasing trend towards normal category from 12+ years onward.

The high frequency of low state of malnutrition in both sexes is mainly due to disproportionate tissues and skeletal muscles where height seem to relatively satisfactory during the growth period. The magnitude of severity seems to be less among the females of lower age and higher age groups. This situation is mainly due to lesser intake of fat and protein that is attributed to the poor socio-economic status of the people.

Pelidisi Index: Table 5 reveals a high frequency of distinctly low state of malnutrition followed by state of mild undernutrition in either sexes. However the male shows higher frequency for both the state of malnutrition compared to their female counterparts. The males were affected from 8+ to 11+ years. A very meager frequency of over weight was found in both sexes.

Though the attainment of sitting height seems to be more appropriate in both sexes the situation of high proportion of malnourished children is due to low weight. Relatively higher frequency of females in the normal category suggests that the females have gained weight proportionally to that of trunk at the adolescent period compared to their male counterparts. It means the requirement of nutrition in vertical growth of skeletal is more than the developing tissues and muscles.

Table 4: Age wise distribution of Pelidisi index among the children

Age (in yrs)	Sample size	*Class*				
		Distinctly low state of nutrition 92	*State of mild under-nutrition 92.1-95*	*Normal state of nutrition 95.1-100*	*Mild overweight 100.1-105.0*	*Distinctly overweight Above 105.1*
Boys						
6	59	21(2.04)	25(2.43)	13(1.26)	-	-
7	47	31(3.01)	13(1.26)	3(0.29)	-	-
8	40	34(3.30)	5(0.48)	-	1(0.1)	-
9	49	43(4.18)	5(0.48)	1(0.1)	-	-
10	45	33(3.21)	8(0.78)	3(0.29)	1(0.1)	-
11	43	33(3.21)	8(0.78)	2(0.19)	-	-
12	44	28(2.72)	13(1.26)	3(0.29)	-	-
13	46	22(2.14)	17(1.65)	3(0.29)	1(0.1)	2(0.19)
14	44	15(1.46)	19(1.85)	10(0.97)	-	-
15	48	21(2.04)	17(1.65)	9(0.87)	1(0.1)	-
16	52	21(2.04)	17(1.65)	13(1.26)	1(0.1)	-
Total	517	302(29.35)	147(14.29)	60(5.83)	5(0.49)	2(.19)
Girls						
6	49	27(2.62)	7(0.68)	14(1.36)	1(0.1)	-
7	51	40(3.89)	10(0.97)	1(0.1)	-	-
8	50	41(3.98)	7(0.68)	1(0.1)	1(0.1)	-
9	45	32(3.11)	10(0.97)	3(0.29)	-	-
10	44	26(2.53)	13(1.26)	5(0.49)	-	-
11	44	24(2.33)	15(1.46)	5(0.49)	-	-
12	40	22(2.14)	8(0.78)	10(0.97)	-	-
13	46	14(1.36)	20(1.94)	11(1.07)	1(0.1)	-
14	50	14(1.36)	11(1.07)	21(2.04)	3(0.29)	1(0.1)
15	49	8(0.78)	17(1.65)	20(1.94)	2(0.19)	2(0.19)
16	44	9(0.87)	9(0.87)	18(1.75)	7(0.68)	1(0.1)
Total	512	257(24.98)	117(11.37)	109(10.59)	15(1.46)	4(0.39)

** Figures in parentheses shown in percentage

From the above it is worth mentioned that not only the regional and seasonal food articles but socio-economic factors are also equally important in determining the nutritional status of any community. The physical dimensions of the body are much influenced by nutrition particularly in growing children. In a multiethnic and geographically vast country like India, food and food habits vary from region to region and season to season and are guided by religion and caste considerations more than socio-economic factors so that people suffer from hunger and malnutrition due to ignorance, superstition and nature of food fed rather than non-availability of adequate food. It has also been observed that stunted growth of Indian children is mainly due to poor nutrition. Different population living in different ecological zones consumes different seasonal food items irrespective of nutritive value. The absorption of that nutritive value is entirely depend on an individuals biology in its totality as genetic constitution, metabolic and physiological activities varies from individual to individual which are solely responsible to meet the nutritional requirement for body development as a whole.

ACKNOWLEDGEMENTS

The authors are grateful to Prof. C. S. Singhrol, Dr. (Mrs.) Manjula Guha, Head of the Department of Anthropology, Pt. R.S.S. University, Raipur, Prof. T. B. Subba, Dean, North-eastern Hill University, Shillong, Dr. Ramesh Chandra, Director, M/O Social Justice and Empowerment, New Delhi, Dr. V. R. Rao, The Director, Anthropological Survey of India. Dr. Saumitra Barua, Sri Ramu Ram, Mrs. R. A.

Table 5: Age-wise distribution of Karperfulla Index among the children

		Grades			
Age (in yrs)	*Sample*	*Low state of Upto 1.20*	*Normal state malnutrition 1.21-1.50*	*Mild over- of nutrition 1.51-1.60*	*weight Obese Above 1.61*
Boys					
6	59	29(2.82)	27(2.62)	3(0.29)	-
7	47	30(2.92)	17(1.65)	-	-
8	40	34(3.30)	6(0.58)	-	-
9	49	46(4.47)	3(0.29)	-	-
10	45	44(4.28)	1(0.1)	-	-
11	43	42(4.08)	1(0.1)	-	-
12	44	44(4.28)	_	-	-
13	46	41(3.98)	3(0.29)	1(0.1)	1(0.1)
14	44	42(4.08)	2(0.19)	-	-
15	48	44(4.28)	4(0.39)	-	-
16	52	50(4.86)	2(0.19)	-	-
Total	517	446(43.34)	66(6.41)	4(0.39)	1(0.1)
Girls					
6	49	28(2.72)	21(2.04)	-	-
7	51	35(3.40)	16(1.56)	-	-
8	50	45(4.37)	5(0.49)	-	-
9	45	42(4.08)	3(0.29)	-	-
10	44	42(4.08)	2(1.19)	-	-
11	44	41(3.98)	2(0.19)	1(0.1)	-
12	40	30(2.92)	10(0.97)	-	-
13	46	38(3.69)	8(0.78)	-	-
14	50	38(3.69)	12(1.17)	-	-
15	49	26(2.53)	23(2.24)	-	-
16	44	19(1.85)	22(2.14)	3(0.29)	-
Total	512	384(37.32)	124(12.05)	4(0.39)	_

** Figures in parentheses shown in precentage.

Jena, Sri C. Ghosh, Sri S. Chatterjee for their co-operation and valuable suggestions. Thanks are due to Dr. D. B. Mandal Head of Office, Anthropological Survey of India ERC, for providing necessary facilities to carry out this study.

KEY WORDS Nutritional Status. Anthropometric Measurements and Indices. Children

ABSTRACT In the present paper a cross-sectional study was carried out with a view to assess the nutritional status among the growing children belonging to the Khaire kunbi caste of Maharashtra. It is found that majority of the children suffers from various grades of malnutrition. The impact of malnutrition is more marked during early childhood period and pubertal period resulting into high frequency of wasting and stunting in both sexes.

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