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RESEARCH ARTICLE

ANTHROPOMETRY AS TOOL FOR ASSESSING NUTRITIONAL STATUS OF ADOLESCENT TRIBAL POPULATION.

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Abstract

Current status of tribal population as reported 2011 census is 8.6% of the nation total population, whereas the tribal population of Maharashtra is 8.6 million. Tribal population of Buldhana District is 115,000(Revenue division TRTI,Pune)Buldana District falls under Amravati division. It was of profound interest to assess nutritional status of the adolescent tribal. However in journal data are scanty on the anthropometry and nutritional status of various tribal populations of India. For Anthropometry body weight in kg, height in centimeters was measured. Further data of height and weight was subjected to calculations values express with means standard deviation and compared with NCHS standard deriving difference results presented in tabularly and graphically. Data was further subjected to BMI values expressed with means and standard deviation. BMI categories were observed by classifying data of BMI and values expressed with percentage. Data on anthropometry revealed that both male and females adolescent were falling short of height as less weight compared to the NCHS standard. Classification of subjects based BMI revealed that irrespective of sex and age groups, a major percentage was falling in normal weight category, followed by under weight category. It has been recently suggested that there is urgent need to evaluate the nutritional status of various tribes in India. (Bose and Chakraborti, 2005, Bose et al 2006).

Introduction:-

India has the largest tribal population in the world perhaps next to Africa.' These tribals have their own socioeconomic and cultural system and are mostly illiterate, ignorant, economically backward and have little awareness about hygienic living and nutritional food intake. Further limited means of subsistence, addiction to alcohol, marriages at adolescent age, early pregnancies low birth weight babies are factors which adversely affect their health status.

A network of 1,31,900 sub centers, 22,156 primary health centers and 2,377 C.H.C. has been established throughout length and breath of the country in an effort to meet the national norms of primary health care. As per the national health norms sub-centre is the most basic unit at grass root level. It is set up for a rural population of 5,000 persons in plains and 3,000 in hilly tribal and backward areas. Inspite of such a vast three tier rural health infrastructure one gets to read and hear about the poor health services and facilities in rural and tribal areas of India. As rightly pointed by Gupta Jayshree (1996) "not to talk about the sophisticated medical equipment that have become common place in towns even simple necessities like tables, weighing machines, blood pressure instruments etc. are not available in large numbers at sub centers. The primary health centers which are expected to provide referral services are marked by inadequacy of drugs, dressing and equipments. Equipment like X-ray machines remain out of order for a major part of the year even if available."

If this is true with 74.28 percent of Indian population what would be the state of health of tribals who dwell in inaccessible and remote areas? In Maharashtra alone several death cases of tribal children, infants and mothers have been repeatedly occurring at intervals in districts of Amravati, Thane and Nashik.

Looking at this existing scenario it was of profound interest to assess nutritional status of the adolescent tribal from Buldhana District. However in general data are scanty on the anthropometry and nutritional status of various tribal populations of India. It has been recently suggested that there is urgent need to evaluate the nutritional status of various tribes in India. (Bose and Chakraborti, 2005, Bose et al 2006).

Review of literature:-

Parvathi, and Khyrunissa (2007), report that mean height of pregnant was 156.2± 4.98 cms from low income family from Mysore city. Zanvar and Rohini (2007) report the height of urban adolescent girls from rural area of Marathwada region to be lower than the NCHS standards. It was also found that girls from low income group had lower weight. Gupta et al (2007) report height of girls from rural and slum areas to be less when compared with girls from affluent urban areas. Bhasin and Jain (2007) observed higher percentage of stunting (maximum 71.4%) at 14 years among Bhill females from Rajasthan.

Gupta et al (2007) observed that the weight girls from rural and slum areas were significantly less compared to affluent adolescent. Varma (2007), observed that weight tribal pregnant women is less that weight of pregnant from developing countries. Parvathi and Khyrunissa (2007), report the weight of pregnant women from low income families from urban region of Mysore city was 55.7±8.7kg. Considered as low index Anthropometry.

Zanvar and Rohini (2007), observed BMI was high in high income group of adolescent girls of Marathwada region.

Aim of study:-

After reviewing above reviews an attempt has been made in the present study to Assess Nutritional Status of Adolescent Tribal Boys and Girls with Anthropometry as major indices like height and weight and Body Mass Index.

Methodology:-

1. Selection of area:-

The objective of present study was to cover adolescent girls and boys. It was therefore planned to reach the same Tribal infested area the tehsils of Buldhana district namely of Sangrampur and Jalgaon-Jamod were selected for study. While selecting area it is important to know tribal population of region and district.

2. Selection of subjects/number of subjects:-

India's draft youth policy defines adolescence as the age between 13 to 19 years (Ganguly). World Health Organization (WHO) has defined adolescent as the age between 10 to 19 years. Ganguly, (2003) Age group from 13-19 years was selected for the present study since the reproductive aspect was to be assessed. Further the sample was divided into three groups. Each age between 13-19 years is characterized by district growth pattern and needs, hence conveniently the three division of samples were as 13-15 years, 16-18 years and 19 years. Indian Council of Medical Research followed the same pattern while recommending dietary allowances.
Pregnant and lactating mothers too were part of study.

3. Description of tools and techniques used in survey:-

1) **Sampling Technique :** Purposive sampling method was used to collect data. Since only adolescent group was assessed purposive method of sampling was adopted.

2) **Statistical Survey :** Collection of data from tribal household on the basis of questionnaire and interview method. Responses tabulated and subjected to statiscal analysis

4. Mode of transport:-

four wheeler was used for accessing the destined area where as a jeep with four wheel drive was used for accessing hilly areas.

5. Anthropometry:-

Physical growth of all the selected adolescent girls was assessed by determining body weight (kg) and height (cm) and by calculating the values of body mass index. The measurements of height and body weight for each girl were recorded by following the standard accepted techniques. Height of the adolescent girls and boys was measured in a standing position to the nearest 0.1 cm using nonstretchable steel tape. A portable weighing machine was used to record the body weight to the nearest 0.5 kg. Body mass of each adolescent was calculated from the recorded measurements of weight (kg) and height (cm). Data of height and weight was subjected to calculations values expressed with means standard deviation and compared with NCHS standard deriving difference results presented in tabularly and graphically.

Data was further subjected to BMI values expressed with means and standard deviation. BMI categories were observed by classifying data of BMI and values expressed with percentage.

Result and discussion:-

Anthropometry:-

Anthropometry as in other stages of life in adolescence also, the nutritional status is best assessed by using anthropometry.

Height:-

In the present study body height of male and female was measured and compared with NCHS standards. The height of an individual is influenced by genetic and environmental factors. The maximum growth potential of an individual is decided by genetic factors, while the environmental factors, the most important being nutrition and morbidity, determine the extent of exploitation of that genetic potential (Rao and Vijayaraghvan 2004).

TABLE 1: DATA ON MEAN HEIGHT & WEIGHT OF SUBJECTS

Sr. No	AGE GROUP [Yrs]	HEIGHT [cm]			WEIGHT [kg]		
		M ± SD	NCHS Standard*	Difference	M ± SD	NCHS Standard*	Difference
MALES							
1	13-15 [n=17]	147.88±10.67 (119-164)	159.67	-12.59	45.61 *(SD 4.55)*	46.83	-0.05
2	16-18 [n=105]	152.16±8.68 (130-170)	174.33	-19.56	45.74 *(SD 5.58)*	61.9	-16.29
3	19 & above [n=13]	153.31±8.34 (141-169)	177	-14.17	47.08 *(SD 7.99)*	65	-12.33
FEMALES							
1	13-15 [n=18]	146.64±4.33 (137-150)	158.33	-14.34	39.64±4.34 (35-50)	47.8	-8.37
2	16-18 [n=142]	145.37±6.59 (119-162)	163	-18.07	42.18±5.85 30-67	53.8	-11.52
3	19 & above [n=22]	146.59±4.84 (136-156)	164	-18.17	42.5±5.79 (30-52)	54.4	-15.4
4	Pregnant Women [n=48]	144.48±6.48 (119-160)	164	-22.17	45.44±5.99 (30-58)	54.4	-8.96
5	Lactating Mothers [n=35]	146.49±4.52 (137-158)	164	-18.0	42.2±6.19 (30-66)	54.4	-15.4

Values in brackets indicate range.

* Values are average of values for age group 13-15 yrs. & 16-18 yrs.

Difference is the calculated based on comparison of actual height & weight with standards for age.

Data from table 1 reflects a wide variation in the minimum to maximum height observed in all the three age groups. A difference of 40-45 cms, was seen in 13-15 years and 16-18 years males, while it was found to be 28 cms in the 19 years age group.

It was observed that female adolescent were falling short in height as compared to the NCHS standards. The difference in height range between -14.34 cms to -18.17 cms. The deficit observed in the 19 year old adolescent female was found to be higher as compared to the male adolescent at the same age group. The minimum to maximum range in height was found to be higher 43 cms in the 16 to 18 age group, while it was minimum 13 cms in 13 to 15 years age group.

An observation common to both the sexes and all age group with respect to the maximum height reached was found to be below to NCHS standards. The adolescent female in the pregnant and lactating stage in the study also had mean height which were below the NCHS standards. The mean difference in height as compared to the standard ranged between minimum of 18 cms to a maximum of 22 cms. Continuous growth during pregnancy is often hypothesized to be an underline cause of incidents of poor outcomes that characterize adolescent pregnancy. A competition for nutrients exists between a still growing mother and her foetus. This is compounded by other factors such as low gynecological age, early menarche or physiological immunity ,which may also be associated with decreased birth weight in very young mothers. Maternal growth during pregnancy has been masked by tendency of girls and woman to shrink in stature while pregnant (TheressaScholl 1990).

Weight :-

Body weight is the most widely used important and the simplest reproducible anthropometric measurement, (Bamji 2004). In the present study body weight (kg) of adolescents in the different age group was measured and mean values derived and compared with NCHS standards Body weight of pregnant women was based on availability and extended till the ninth month. Means and standard deviation along with minimum to maximum range is presented in table 1.

Observations from the table reveal that mean weight of both male and female adolescents were not in accordance with the standard values. It was surprising to note that the mean weight of all the three age groups in the male adolescent was ranging between 45 kg to 47 kg, indicating that with the increasing age a corresponding increase in weight was not reflected. However the differences in mean weight of 13-15 years adolescent were found to be comparatively lower (0.05) kg. as compared to standard value, this difference was found to be highest (16.29) kg in the 16-18 year old adolescents. The mean weight of 19 year old adolescents also showed a defecit of almost 12 kg. as compared to the standard value.

Body weight measurement of girls were also found to be defecit with respect to NCHS standards for each age group. An increase in range in the mean defecit (-8.37 to 15.4) kg as compared to standard with increasing age.

Reasons for low weight could be attributed to less dietary intake and more physical activity. It is observed that all adolescents were working as labourers in fields or engaged in cultivation in their farms. Pregnant and lactating women were also working. It is a practice among tribal's not to care in pregnancy and lactation with respect to rest or diet. Pregnancy is considered a natural phenomena and necessity is not felt with any antenatal or postnatal care. Tribal women of Korwa, Patalkot, Bharias and Kamar work and continue to do all normal house hold work including fetching of water, cutting wood and no special diet is given to them. (Pandey, Tiwari 2001).

It was observed during course of study no special care with respect to food and nutrition was taken for pregnant and lactating mothers, above studies support the observations.

The data on height and weight have been graphically presented in figure 4.1a, 4.1 b, 4.2 a, & 4.2 b,

Figure 4.1a: Data on Mean, Minimum & Maximum Values of Height In Comparison with Standard Values for Males Classified Age Wise

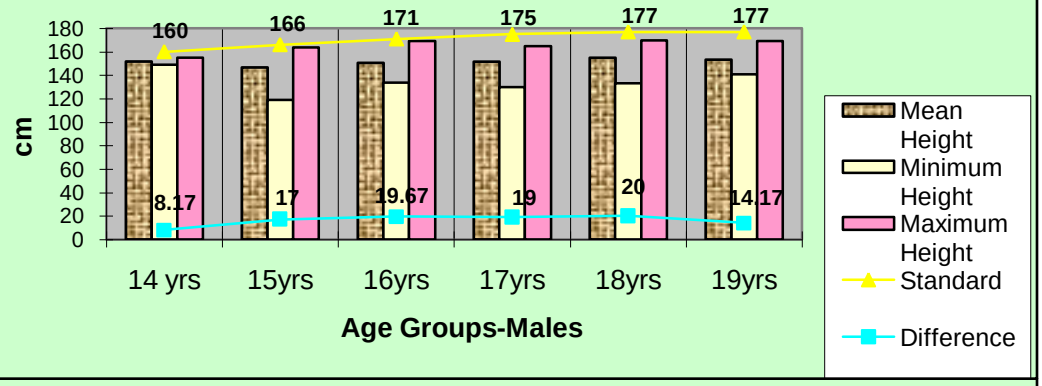
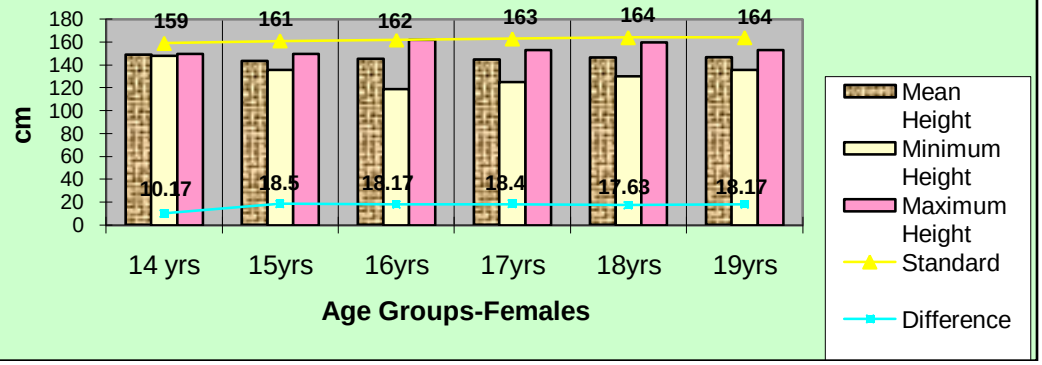


Figure 4.1b: Data on Mean, Minimum & Maximum Values of Height In Comparison with Standard Values for Females Classified Age Wise



An comparison has been drawn between the minimum height and weight achieved at each age both in male and female subjects. It is observed from fig. 4.1 a, 4.1 b that considerable difference in height in both male and female subjects observed at all ages even the maximum height observed in all the age groups in both the sexes were falling short of the NCHS standards. The observations are similar in both the sexes.

Graphical representation on weights is observed from table 4.2 a and 4.2 b,

Figure 4.2a: Data on Mean, Minimum & Maximum Values of Weight In Comparison with Standard Values for Males Classified Age Wise

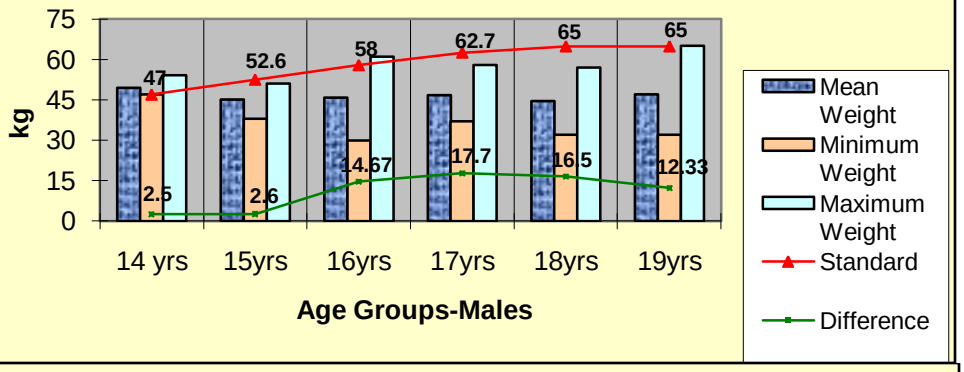
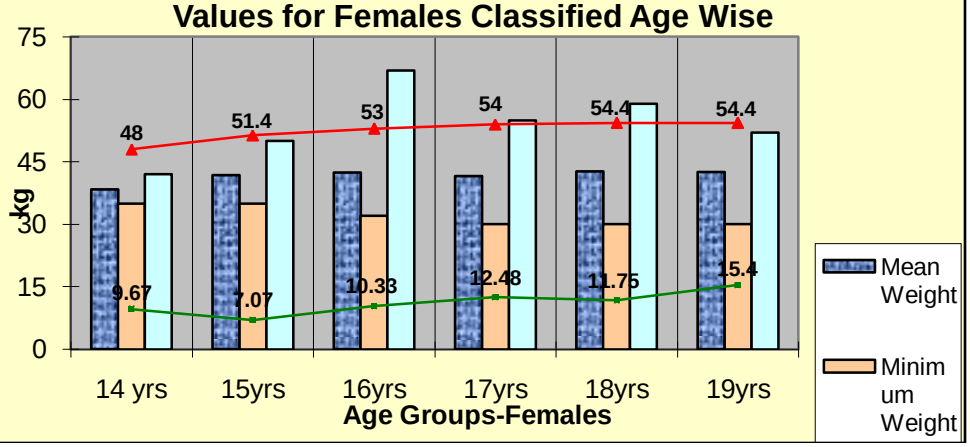


Figure 4.2b: Data on Mean, Minimum & Maximum Values of Weight In Comparison with Standard Values for Females Classified Age Wise



It is observed that in the male subjects the maximum weight at 14 & 16 years of age was exceeding the standard value. However at 16 years of age the mean and minimum weight were found to be much below the standards, similar observation are reflected at 17-18 years of age. The curve representing the difference in weight as compared to the NCHS standards reflects a steep rise at 16 -17 years with a slight decrease at 18 years followed by further decrease at 19 years.

The graphical representation showing the mean minimum and maximum values of male as compared to standards in females differ from these observed in males. In the female subjects the maximum weight attained was found to be higher than standards at 16, 17 and 18 years of age, while it compared favorably at 19 years of age. The means and minimum weight of female subjects were found to be below the standards at each age as also observed from 4.7 a. The difference was found to be more or less in the same range at 16, 17, 18 and 19 years age of the subjects.

Body mass index:-

As discussed early data presented in table 4.2 indicates a wide variation in the minimum to maximum ranges of height and weight of the adolescents in both the sexes. Hence an attempt was made to individually categorize them based on their body mass index so as to ascertain their nutritional status.

The index of weight (in kg) / Height^2 (cm) is refered to as Body Mass Index. It provides a reasonable indication of the nutritional status. The BMI has good co-relation with fatness. Reduced BMI is an indicator for chronic energy

deficiency (CED) which is a common problem in a developing country. Results from the present study are interpreted according to classification suggested by James et al. and Luizz et al. (1992) and presented in table 2.

TABLE 2: DATA ON MEAN BMI OF SUBJECTS

Sr. No	AGE GROUP [Yrs]	BMI (kg/m^2)	
		M ± SD	Range
MALES			
1	13-15 [n=17]	20.86±2.46	16.9-26.6
2	16-18 [n=105]	20.12±3.13	14.3-37.7
3	19 & above [n=13]	20.05±3.10	15.3-24.2
FEMALES			
1	13-15 [n=18]	18.48±2.45	16-23.8
2	16-18 [n=142]	19.75±2.62	12.3-27.7
3	19 & above [n=22]	20.3±2.24	16-23.8
4	Pregnant Women [n=48]	21.29±2.69	14.5-27.5
5	Lactating Mothers [n=35]	19.23±2.13	14.4-23.9

Classification of subjects based on BMI has eronically shown that male subjects in all age groups were in the normal category, while the female subjects between 13-18 year of age were in low weight normal and those of 19 years were in normal category.

According to Gopalan, (2001) the data on BMI needs to be interpreted with caution. Figures of 'normal' BMI in Indian women may be misleading. In calculation of BMI height is the denominator, shortness of stature and stunting, therefore, could give high values of BMI. Thus stunted women with body weights less than 40 kg. could have satisfactory BMI.

The minimum to maximum BMI showed a wide range and hence the subjects were classified based on their individual BMI into the different categories. The percentage distribution of subjects is
shown in table 3.

TABLE 3: DISTRIBUTION OF SUBJECTS BASED ON BMI CATEGORY (%)

Sr. No.	AGE GROUP [Yrs]	BMI CATEGORY						
		CED - III	CED - II	CED - I	Underweight	Normal	Obesity - I	Obesity - II
MALES								
1	13-15 [n=17]	0	5.88(1)	11.77(2)	17.65(3)	58.82(10)	5.88(1)	0
2	16-18 [n=105]	4.76(5)	4.76(5)	18.09(19)	24.76(26)	42.86(45)	3.81(4)	0.95(1)
3	19 & above [n=13]	23.08(3)	0	0	30.77(4)	46.15(6)	0	0
FEMALES								
1	13-15 [n=18]	0	27.78(5)	16.67(3)	22.22(4)	33.33(6)	0	0
2	16-18 [n=142]	4.23(6)	9.85(14)	17.61(25)	24.65(35)	40.14(57)	3.52(5)	0
3	19 & above [n=22]	0	9.09(2)	13.64(3)	18.18(4)	59.09(13)	0	0
4	Pregnant Women [n=48]	0	2.08(1)	14.58(7)	16.67(8)	62.5(30)	4.16 (2)	0
5	Lactating Mothers [n=35]	8.57(3)	11.43(4)	17.14(6)	22.86(8)	40(14)	0	0

CED – Chronic Energy Deficiency

Classification of subject based on BMI reflected that irrespective the sex & age groups a major percentage were falling in normal weight category followed by the under weight category. CED grade – I, category was observed in the 16-18 age group in larger number in both sexes as compared to the other age groups. It was surprising to note that in both the subjects a few subjects were classified under obesity – I, category.

Conclusion:-

Data on anthropometry revealed that both male and females adolescent were falling short of height as less weight compared to the NCHS standard. Mean weight of tribal pregnant women from present study was observed to be 45.44±5.99 which is alarmingly low. Body Mass Index of the subject was determined to assess their nutritional status. Classification of subjects based BMI revealed that irrespective of sex and age groups, a major percentage was falling in normal weight category, followed by under weight category. It was surprising to observe that among pregnant women with less body weight and height than standard, 66% had normal BMI. According to Gopalan(2001) the data on BMI needs to be interpreted with caution. Figures of normal BMI in Indian woman may be miss leading. In calculation of BMI height is the denominator. Shortness of stature and stunting, therefore, could give high values of BMI. Thus stunted women with body weight less 40 kg could have satisfactory BMI.

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