

## Assessment of Nutritional Status of Adolescent Mahadev Koli-A Scheduled Tribe of Maharashtra

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### Abstract

*A cross sectional study was conducted among the Mahadev Koli tribe of Ambegaon taluka, Pune district, Maharashtra. The study was aimed at assessing the nutritional status using anthropometry. Data were collected from 232 girls and 238 boys in the age group 10 years to 19 years, residing in five villages. The mean values for comparison and various indices are computed. Mahadev Koli are found to have low nutritional status when compared with reference values. Weight for age reveals that 100% boys and 72% girls fall under Gr. II level of malnutrition, and remaining girls are under grade I and grade III of malnutrition. Height for age shows that both boys and girls are marginally malnourished. Assessment on the basis of weight for height reveals that 71% of boys and 29% of girls are moderately malnourished whereas 29% of boys and 57% of girls are severely malnourished. The status of MUAC of boys and girls is also low. Clinical parameters show 7.8% individuals having skin related problems due to unhygienic conditions. Gums and tongue also show the evidence of malnutrition. The normal diet consists of rice. Nutritional status of adolescents is found to be serious. Inadequate and irregular supply of food, ecological situation, and genetic composition are other responsible factors for malnutrition.*

*Keywords - Nutritional Status, Malnutrition, Health Status Demographic Factors*

### Introduction

Good nutrition is the cornerstone for survival, health, and development. Nutrition also has larger economic implications. A healthy society entails better productivity, lower health care costs, and greater economic output. However, poverty, hunger, and resultant under-nutrition prevent individuals, societies, and even entire nations from achieving their full potential.

Malnutrition is an impairment of health resulting from deficiency, excess, or imbalance of nutrient intake or body utilization. It includes over nutrition, such as an excess of calories and vitamin

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A toxicity etc. It also includes under nutrition, resulting from a deficiency of calories and/or some other nutrient(s). Malnutrition may be primary, that is, caused by some fault in the diet, or secondary, that is, caused by some error in metabolism or some interaction between nutrients, medications, and so on. Malnutrition in a population is a consequence of a range of factors that are often related to insufficient food consumption, ingestion of poor quality food, lack of health services etc.

In the present study the word malnutrition will refer to condition caused due to under nutrition. Nutrition refers to the processes by which living organisms absorb and utilize food substances (Encyclopedia Britannica, Vol. 8). "Malnutrition is the pathological state resulting from a relative or absolute deficiency or excess of one or more essential nutrients." (Jelliffe, D.B. 1966). The preceding discussion of childhood and adolescent under-nutrition is focused on consequences for growth, maturation, performance and physical activity. A history of chronic undernutrition in the early years of life also has implications or more specifically, consequences for adult health. Individuals who survive an infancy and childhood characterized by chronic undernutrition and associated environmental condition attain shorter heights as adult. Short stature in woman is associated with poor reproductive health and outcomes. Short maternal height is a risk factor for increased infant mortality. Small body size in adult is also associated with reduced physical working capacity. Among adults with a history of chronic undernutrition during childhood, productivity under conditions of moderate and hard work is related to body size, and evidence clearly indicates that bigger is better (Spurr 1988).

Clearly adolescence is a pivotal stage of the life cycle and it in turn provides a unique opportunity to foster a healthy transition from childhood to adulthood. The adolescence is the difficult time for the youth of today. (Robert M. Marina, Claude Bouchard, Oded Bar - Oz, Growth, malnutrition and physical activity, 2nd ed., by Human kinetics, 2004). The recent WHO survey shows that approximately, 43% of children (230 million) in developing countries are malnourished and hence have hampered growth, (WHO, 1992). The tribal scenario is such and very few studies have been done on the adolescent nutrition of the tribes.

The present study takes into account one of the tribal groups of Maharashtra, Mahadev Koli. The population under consideration

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is adolescent population (10 - 19). Malnutrition among adolescent population is checked with Nutritional Anthropometry. "Nutritional anthropometry deals with the measurement of the physical dimensions and gross composition of the human body, at different age level during the post natal period of growth and degree of nutrition." (Surinder Nath, 1993).

Nutritional assessment is an important tool for identifying the individuals who are suffering from and/or who are at the risk of malnutrition. Assessment of nutritional status is conventionally done through dietary, anthropometric, and clinical parameters. In the present study, the emphasis has been given on the anthropometric measurements and on clinical signs.

### **Objectives of the Study**

To assess the nutritional status of the adolescent population on the basis of anthropometric measurement.

To study the clinical signs in addition to nutritional anthropometry.

### **Material and Methods**

The present study was conducted in five villages of Ambegaon Taluka, of Pune District of Maharashtra. Data were collected from Aghane, Tirpad, Ahupe, Terungan, and Mhatarbachi wadi villages. Sample size of study is 470 individuals including both adolescent boys and girls, out of which 232 are girls and 238 are boys. De - facto population was used for anthropometry. Systematic sampling was used for interview schedules. Along with age and sex of an individual, height, weight, mid upper arm circumference were taken following appropriate anthropometric techniques (Jelliffe, 1966). The first two variables along with the age provide one piece of information about a person. When they are used together they can provide important information about a person's nutritional status. When two of these variables are used together they are called as index.

Clinical examination involves looking for changes (clinical signs) in the body that are indicative of a particular deficiency. It is however important to remember that survey work based on clinical signs alone may not give a very true picture of the problem. With the discussion with doctors, the sites chosen for clinical examination were hair, skin and teeth; which are easy to locate and which show

some marked changes during the period of under nutrition.

## Results and Discussion

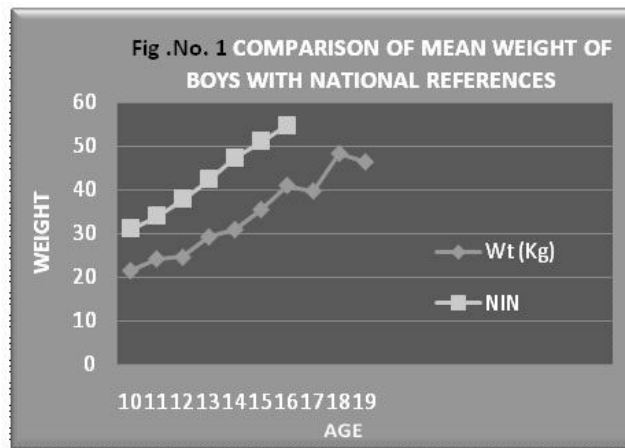
### Anthropometry

The mean values for weight, height and mid - upper arm circumference are compared with Hyderabad standards (NIN) (www.textbooksonline.tn.nic). The comparison is made up to age 16+ because the availability of comparative values up to that age groups. The mean value comparison of weight, height, and MUAC with standards is shown in following tables.

**Table No. 1.1** Comparison of Mean Weight of Boys with National References.

Age	Wt (Kg)	NIN
10	21.57143	31
11	24.245	34
12	24.61905	37.8
13	29.21509	42.4
14	30.89583	47.3
15	35.45	51.1
16	40.91622	54.8
17	39.64706	
18	48.16667	
19	46.25	

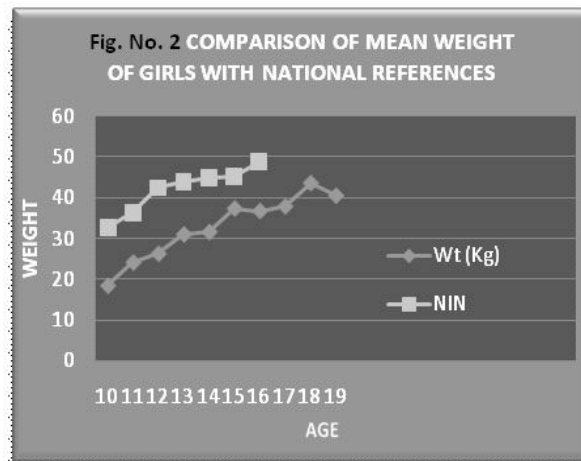
\*Reference values for age groups 17, 18, and 19 in case of NIN, were not available.



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**Table No.1.2** Comparison of Mean Weight of Girls with National References.

Age	Wt (Kg)	NIN
10	18.4	32.6
11	24.10204	36.3
12	26.23684	42.5
13	30.95313	43.9
14	31.55357	45
15	37.28788	45.3
16	36.67143	49
17	37.8	
18	43.5	
19	40.41667	



\*Reference values for age groups 17, 18, and 19 in case of NIN, were not available.

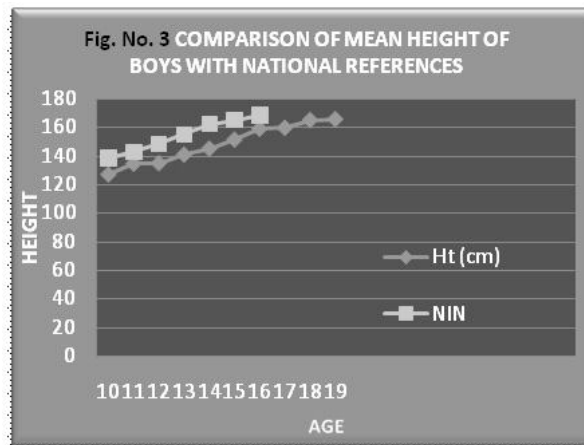
The above tables show the comparison of weights of boys and girls with the references. It is very clear that observed weights are below the reference values. It is also seen that difference between reference weights and observed weights increases with the increase in age. This is because as age increases, need for food and nutrients increase; this is true especially in adolescent period. Adolescence is a period with increased nutritional requirement. (WHO, 1995) Rapid accretion of new tissue and other widespread developmental changes are accompanied by increased nutritional requirements relative to the childhood years. In case of boys the deviation is seen at the age 17 years because of less sample size.

Like boys, girls also observed lower values than the reference values. There is drastic fluctuation at the age 15 and 18. In this age group majority of girls attained their menarche and responsible for fluctuation of weight. For adolescent girls, the greatest gain in height and weight normally occurs in the year preceding menarche. (Robert M. Marina, Claude Bouchard, Oded Bar - Oz, Growth, malnutrition and physical activity, 2nd ed., by Human kinetics, 2004). But still adolescent girls of Mahadev Koli tribe show a different picture.

From weight, current nutritional status of both of them is very serious.

**Table No.2.1** Comparison of Mean Height of Boys with National References.

Age	Ht (cm)	NIN
10	126.8857	138
11	134.3975	142.7
12	134.7714	148.4
13	140.7057	155
14	145.0125	162.6
15	151.2767	165.5
16	158.8973	168.9
17	159.5412	
18	165.0333	
19	165.6667	

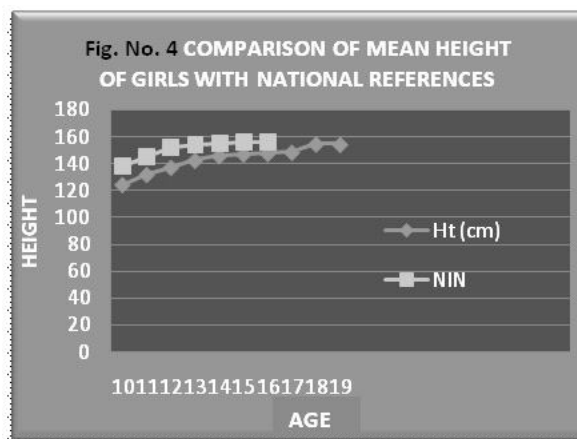


\*Reference values for age groups 17, 18, and 19 in case of NIN, were not available.

**Table No. 2.2** Comparison of Mean Height of Girls with National References.

Age	Ht (cm)	NIN
10	124.54	138.2
11	132.0939	145.1
12	137.3737	151.5
13	142.6781	153.8
14	145.95	154.8
15	147.2545	155.8
16	147.7714	155.8
17	148.6	
18	154.7333	
19	154.4667	

\*Reference values for age groups 17, 18, and 19 in case of NIN, were not available.



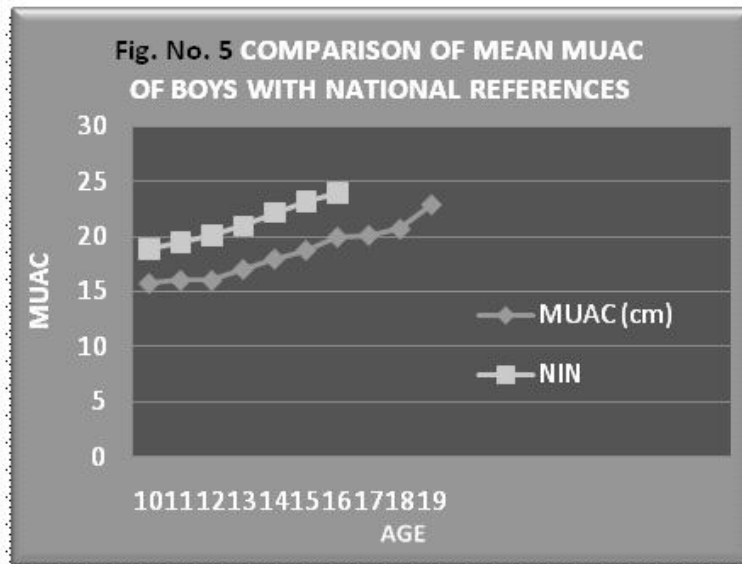
According to Fig. No. 3 and Fig. No. 4 comparison of height of boys and girls with reference values shows that observed height values, though below, are very close to reference values. In case of boys there is less difference observed within age group 10 and 11 because of pre - pubertal spurt. But the difference is increased up to age 15 and later it again goes closer to reference values. This is a genetically set pattern of height of an individual. In case of girls, the condition is slightly different than boys. As age increases difference between observed values and reference values get reduced. It is because of girls' attain menarche after 12 - 13 years of age and shows comparative normalness in relation with reference values.

Height is determined by the interaction of genes and environment. Final adult height may be attained anywhere from the early teens to early 20s, though it is most commonly reached during the mid teens for females and late teens for males and nutrition is the most important factor in determining height.

**Table No.3.1** Comparison of Mean Muac of Boys with National References.

Age	MUAC (cm)	NIN
10	15.75714	18.9
11	16.0325	19.5
12	16.01905	20.2
13	17.02264	21
14	17.9625	22.2
15	18.74333	23.2
16	19.92703	24
17	20.1	
18	20.66667	
19	22.86667	

\*Reference values for age groups 17, 18, and 19 in case of NIN, were not available.

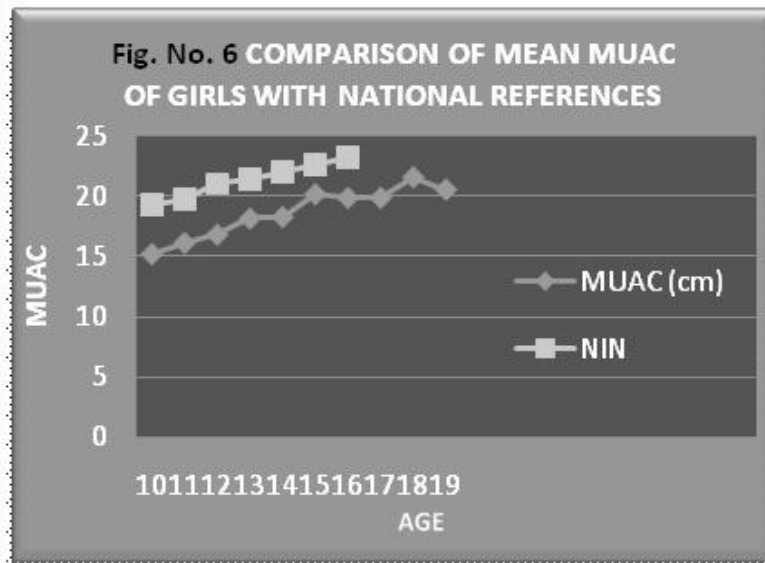




**Table No.3.2** Comparison of Mean Muac of Girls with National References.

Age	MUAC (cm)	NIN
10	15.24	19.28
11	16.16735	19.78
12	16.85263	21.04
13	18.19688	21.43
14	18.31429	22.06
15	20.19697	22.62
16	19.89524	23.24
17	19.9	
18	21.6	
19	20.58333	

\*Reference values for age groups 17, 18, and 19 in case of NIN, were not available.



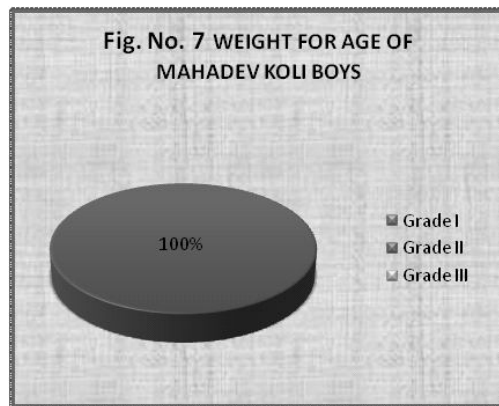
From the fig. no. 5, we can see that observed values are lower to the reference values. But even if they are low, the growth is continuous. Sudden rise or fall is not reported. In the age group 16, 17 and 18 values are some what stable. In girls (fig. no. 6), situation of observed values is different than the boys. There is sudden increase in MUAC at the age 15 because of pubertal growth spurt. Inadequate food intakes, lacking sufficient supply of fats and nature of work are the main reasons for the lower MUAC.

**Indices**

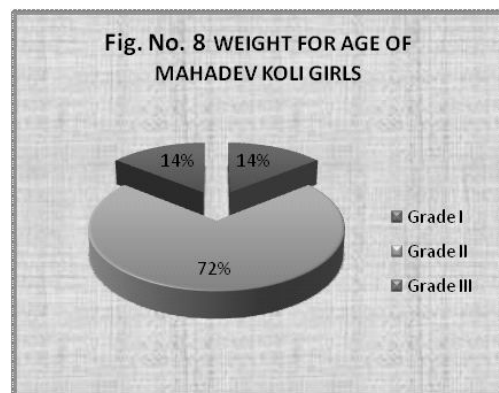
**Gomez Classification (weight - for - age)**

Low weight-for-age index identifies the condition of being underweight, for a specific age. The advantage of this index is that it reflects both past (chronic) and/or present (acute) under nutrition (although it is unable to distinguish between the two).

Fig. no.7 shows that 100% of individuals show Grade II level of malnourishment. As the sample is of adolescent period, when there is increased need of nutrition, screened individuals are lacking it. This condition of wasting or retardation in weight is due to both environmental and genetical factors also.



Majority of girls (72%) show grade II level of malnourishment. 14% girls are of grade I and 14% girls are of grade III level of malnourishment. It also indicates that in the growth spurt age girls lack proper nutritional food in diet. But they are on the border line and might be temporarily shifted to grade III level of malnourishment.



### Waterlow's Classification (Height - for - age)

Low height-for-age index identifies past under nutrition or chronic malnutrition. It cannot measure short-term changes in malnutrition. A deficit height-for-age is referred to as stunting. The extent of height deficit in relation to age, as compared to standards, may be regarded as a measure of the duration of malnutrition.

Fig. no.9 shows that 86% boys are marginally malnourished whereas 14% individuals fall under moderate malnourishment. This condition of malnourishment is not serious. Severe malnourishment is not reported from this age group.

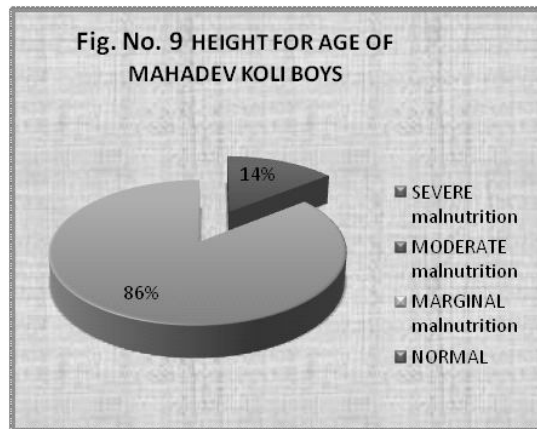
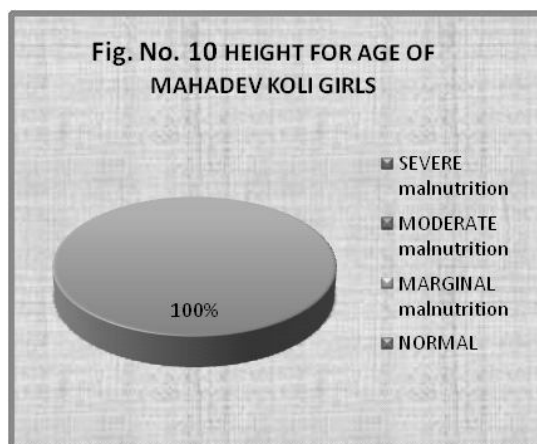


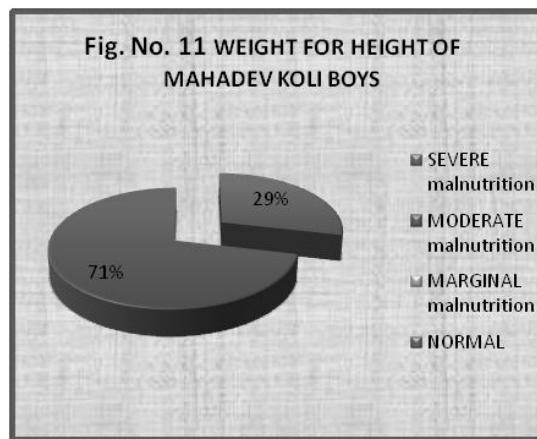
Fig. no. 10 shows that 100% of boys are marginally malnourished. This condition proves that malnourishment is not severe. But still due to ecological conditions and seasonal variations the overall growth status fall under marginal malnourishment.



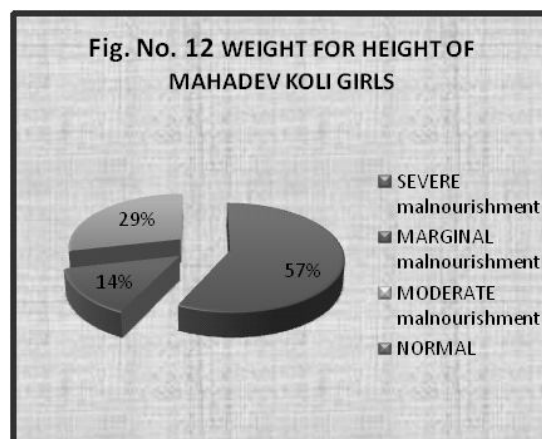
### Weight - for - Height

Low weight-for-height helps to identify children suffering from current or acute under nutrition or wasting and is useful when exact ages are difficult to determine. Weight-for-height is appropriate for examining short-term effects such as seasonal changes in food supply or short-term nutritional stress brought about by illness.

Analysis of Weight - for - Height shows that 71% of boys are moderately malnourished. 29% of individuals are severely malnourished.



In case of girls the condition is different than those of boys. Here in this fig. no. 12, 57% individuals are severely malnourished. 29% are moderately malnourished and 14% are marginally malnourished.



### Clinical Sign Examination

**Table No.4** Different sites for Clinical Signs Examination

<b>Eye</b>	Bitot Spot	Grey Spot	Night Blindness
%	2.035	4.36	0.29
<b>Lips</b>	Angular Scares		
%	1.163		
<b>Tongue</b>	Atrophic Papillae	Oedema	Magenta Tongue
%	29.069	9.302	2.907
<b>Teeth</b>	Mottled Enamel	Mottled Enamel with Dental Caries	Dentle Caries
%	31.105	37.209	12.79
<b>Gums</b>	Swelling with Bleeding		
%	68.895		
<b>Nails</b>	Brittle and Spoon Shaped		
%	18.604		

In the present study the sites chosen for clinical examination were eyes, tongue, nails and teeth; which are easy to locate and which show some marked changes during the period of under nutrition.

The results indicate that fewer individuals were showing visible signs of under nutrition when this cross-sectional study was conducted. Out of 344 individuals screened result indicates that, 2.03% individual show Bitot spot on the white conjunctiva. It is white foam like deposit, associated with Vitamin A deficiency. Vitamin A is necessary for clear vision in dim light. Lack of vitamin A also leads to night blindness. Another function of vitamin A is to maintain integrity of epithelial tissues; in the absence of which, the

outer lining of the eyeball loses its usual moist white appearance and becomes dry and wrinkled. Redness and inflammation of the eyes and gradual loss of vision may follow. Main sources of Vitamin A are foods like papaya, carrot, tomato etc.

29.06% individuals show Atrophic Papillae on tongue which show Riboflavin and iron deficiency. 2.09% individuals show magenta tongue which again shows Riboflavin deficiency. Riboflavin (B12) is one of the B complex vitamins. One can get it from milk, milk products, eggs, etc. Rice is a very poor source of Riboflavin and as rice is staple food of Mahadev Koli's they lack this in their body and thus leads to this type of deficiency. 9.30% individuals show oedema hence showing deficiency of Thiamine and Protein - calorie malnourishment.

37.20% individuals show Mottled enamel and Dental caries, 31.10% show only mottled enamel and 12% show only dental caries. Such condition, which shows a condition of excess fluorides results in Fluorosis. Dental caries and mottled enamel may be because of genetical pattern of an individual, so sign of teeth depend upon this factor also. 68.89% individuals show swelling and bleeding gums which reflects the Vitamin C deficiency and 18.60% individuals show brittle and spoon shape nails which indicates Iron deficiency. Also protein calorie malnourishment shows lack of proteins especially animal protein in diet.

From available data it is observed that among the individuals screened they show lack of riboflavin, proteins, vitamin A, and vitamin C in diet. It is also observed that animal proteins, fruits and B12/ riboflavin rich food lacks in their diet.

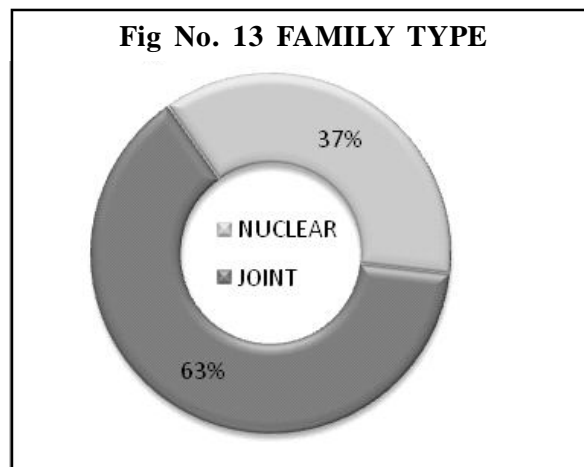
### **Demographic Factors**

As the nutritional situation is a manifestation of complex biological and social processes in society, it is evidently intertwined with the social, political and economic developments of society. It is acknowledged that there is a two-way direct causal relationship linking social and economic conditions with nutritional status and the underlying determinants of food security, caring capacity and essential services like health services; education; water and sanitation. (Gopaldas Tara. and Shubhada Sheshadri ,1987).

Household food security is reflected through socio-economic status that includes variables like family type, family size, occupation, etc.

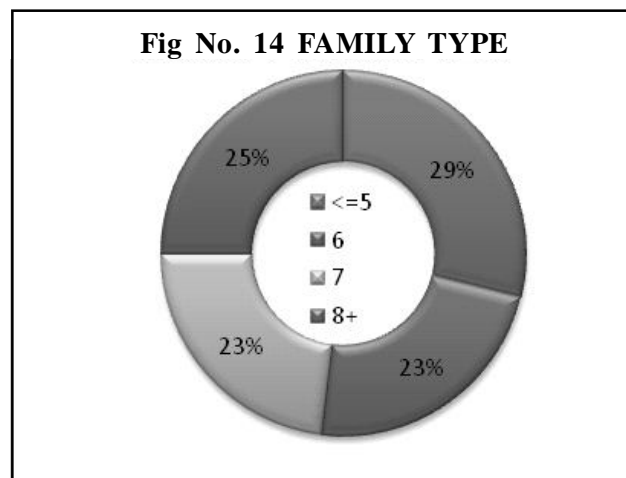
### Family Type

Status of family type is very important for person's nutritional status. The graph shows clearly that most of the families are joint families (63.46%) and (36.53%) are nuclear families. Joint family structure in relation with economic condition distributes the amount of food and finally affects the nutritional status of an individual.



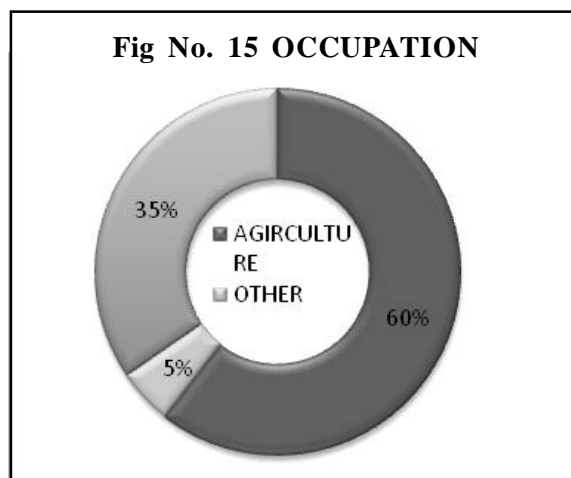
### Family Size

Figure 14 shows that 25% of households have family size of 8+, which is followed by 7 (23.07%) and then 6 (23.07%). There are some families having family size less than 5 (28.84). From this statistics we can trace that in most of the families available food is distributed within more than 6 members.



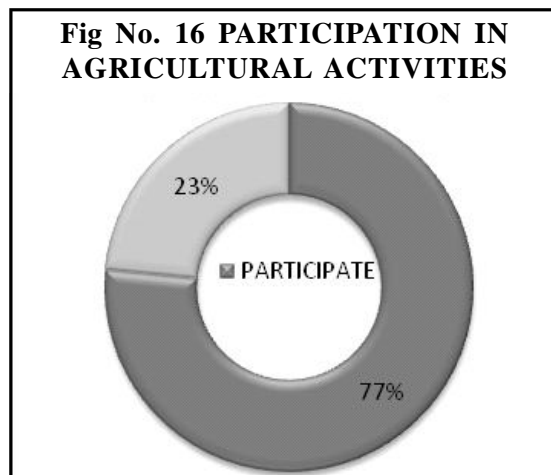
### Occupation

Figure 15 indicates that 60% of families have their main occupation as agriculture while 5% families have their main occupation other than agriculture. They work as farm laborers and collection of "Hirda" (Terminalia Chebula). 35% have both agriculture and collection of "Hirda" as their main occupation. However lacks of irrigation facilities are responsible for fewer yields. The main crops cultivated are Rice and Nagali.



### Participation in Agricultural Activities

The present figure 16 indicates that 77% adolescent individuals including both boys and girls participate in agricultural activities, whereas 23% do not participate in this activity. Those





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who do not participate in the agricultural activities, contribute in household activities, which is common among girls. This type of physical activities contributes in the overall nutritional health of an individual.

### **Conclusion**

"In India the position of indigenous populations has declined with the degradation of their forest resources, the shrinking of common property grazing lands and the loss of agriculture lands. Driven into poverty, tribal communities, which once practiced more sustainable forest management, began overexploiting local resources. As the resource base degraded further under these pressures, the cycle of poverty, migration and social erosion has intensified" (World Food Program WFP; 1998). However scenario in tribal Maharashtra is not much different. Tribal groups of Maharashtra are staying in remote forest or hilly areas and majority of them have poor health status.

The holistic approach of anthropology helps in the development and application of anthropological methodologies for studying key aspects of the nutrition of individuals, families and communities. (Robert M. Marina, Claude Bouchard, Oded Bar - Oz).

The total sample size of the study is 470, out of which 232 are girls and 238 are boys. The results show that overall growth status of both the tribal adolescents is low as compared to National references values of NIN. It can be seen that the observed mean values are less than the reference values, in all the three anthropometric parameters taken into consideration, representing the major growth faltering. The height comparison shows lesser faltering as compared to the weight. This brings to the forefront that their innate potential to grow normally is being hampered by harsh environmental condition.

From analysis of indices it is easily observed that even if boys and girls are equally malnourished, boys are slightly more malnourished than the girls. This may be due to different growth pattern of girls than boys during pubertal stage. The clinical signs examination shows compatible results with the present condition

of malnourishment. In the present study the sites chosen for clinical examination were eyes, tongue, nails and teeth. From these sites it is clear that individual screened show lack of Riboflavin, proteins, Vitamin A, Vitamin C in diet. It is also observed that animal proteins, fruits and B12/ Riboflavin rich food lacks in the diet.

Other factors such as family size, family type and occupation were shown to have an important role in the growth of an adolescent. Main occupation of Mahadev Koli's is agricultural work. All this factors play very significant role in the individual's nutritional status.

Some concluding points drawn from the study are:-

1. The overall nutritional status of adolescent Mahadev Koli is low.
2. From different indices, boys are slightly more malnourished than the girls.
3. From Clinical signs it is clear that they are deficient in riboflavin, proteins, vitamin A, and vitamin C in their diet.

#### **Limitations of the Study**

Very difficult to take clinical signs from all over the body.

Difficult to take measurements in minimum clothes.

Doctor is required to take certain measurements.

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