Summary
6. SUMMARY

Growth is a fundamental phenomenon in all living organisms, though the time taken and the stages attained before the ‘adult biotype sets is different in every animal and man. The period of growth, as Tanner (1962) states, occupies more than a quarter of person’s lifetime. The terms ‘Growth and Development’ are often used interchangeably. But strictly speaking, they are not interchangeable but interdependent. Growth refers to proportionate changes in size of parts of an organism whereas development reflects changes in character or function i.e increasing complexity and progress towards maturity. Growth and development of an individual begin at conception and continue throughout life (Valadin et al, 1977). Development denotes concept often used in two distinct contexts i.e. biological and behavioral. Development includes three diverse processes: a) Growth b) Differentiation c) Maturation. Differentiation refers to the specialization of the cells according to the functions. Maturation refers to the changes in the function with or without an observed change in structure.

Growth periods are divided into developmentally functional stages. The life cycle may be said to begin with fertilization and then proceed through prenatal growth and development, birth, postnatal growth and development, maturity senescence and death. Adolescent growth spurt is a constant phenomenon and occurs in all children during Adolescence, thought it varies in intensity and duration from one child to another. Considerable changes in physiological function occur during the adolescent growth spurt. They are much more marked in boys than girls. Growth is influenced by both intrinsic and extrinsic factors. These two factors are very rarely separable and they almost invariably interact. The progress of any child is the result of a complex interaction of many different factors Heredity, Hormones, Environment, Ethnicity, Disease, Psychological, Nutrition, Socio-economic, Migration and Urbanization, climate, and altitude.

The first systematic attempt of studying growth and development of Indian children was made by ICMR from 1956 to 1965 in order to provide growth norms of Indian children on a regional basis and on different socio-economic groups. Tribes and castes
exhibit variation in their pattern of growth because of cultural practices. Caste groups are much larger and have different nutritional intake and are liable to adopt modern ways of life while tribes are traditional communities and are not liable to such a change in their life style. Keeping this in view the present study was planned. The literature review revealed that no proper growth study has been reported, on the pre-adolescent and adolescent females of Uttarakhand. Thus present cross sectional study was conducted on pre adolescent and adolescent Jaunsari (tribal group) and Garhwali (non tribal group) Rajput females of District Dehradun, Uttarakhand. Both Jaunsari and Garhwali Rajput population groups share a common environment but they are genetically and socioeconomically diverse.

The present study is conducted with following objectives:

1. To study differences in growth patterns between pre adolescent Rajput females of Jaunsar-Bawar and Dehradun, Uttarakhand.

2. To study differences in growth patterns between adolescent Rajput females of Jaunsar-Bawar and Dehradun, Uttarakhand.

3. To observe the age of adolescent spurt in the Rajput females of Jaunsar-Bawar and Dehradun, Uttarakhand.

4. To study differences in the nutritional status between the pre adolescent and adolescent Rajput females of the two hill populations.

Present study comprises of a total of 1319 Rajput females (664 Garhwali and 655 Jaunsari) in age range of 8 to 18 years. Data has been collected from door to door in residential location and from schools within fieldwork area. In order to accomplish the aims of the present study following measurements have been obtained on each subject using the standard techniques recommended by Weiner and Lourie, 1969.

Different measurements included following body measurements: Body weight, height, sitting height, Upper Arm Length, Height Tibiale, Fore Arm Length, Height Iliospinale, Sitting Height, Height Spherion, Foot Length, Total Arm Length, Hand
length, Bicristal Breadth, Biacromial Breadth, Waist Circumference, Calf Skin fold, Hip Circumference, Sub scapular Skin fold, Mid Upper Arm Circumference, Triceps Skin fold, Lower leg Length, Thigh Length and Total Lower Extremity Length.

Data were collected by following the random technique of sampling. Adequate care was taken to include apparently normal and unrelated individuals in the present study. Inclusion and exclusion criteria were also modulated for data collection, subjects who are inhabitants of Dehradun District (Uttarakhand) for the last 3 generations, without any apparent physical disability, and with proof of age (such as birth certificate or school record) considered under inclusion criteria and opposite to is considered under exclusion criteria.

After the data collection, the statistical analysis of the data was performed with the help of SPSS package for calculation of means, standard error of estimate, ‘t’ test and correlation.

Nutrition status of Garhwali and Jaunsari Rajput females has been assessed by considering BMI, WHR, Height and Body weight percentiles.

The statistical analysis of the present study highlights the following facts:

- Garhwali females are heavier and taller than Jaunsari females at all age years. Garhwali females are greater in sitting height at all age groups than Jaunsari females.

- In lengths (total arm length, upper arm length, fore arm length, lower leg length, total lower extremity length, thigh length and foot length) Garhwali females shows greater values than Jaunsari from 8 to 10 years. Jaunsari females exhibits lower values in lengths than Garhwali at 14 to 16 years in Total arm length, 11, 14, 16 and 17 years in upper arm length, 11 to 14 years in forearm length, 12 to 16 and 18 years in lower leg length, 12, 15 and 18 years in total lower extremity length, 11, 12, 15 and 18 years in thigh length and at 11 and 17 years in foot length.
• In breadths (biacromial and bicristal breadth) Garhwali females show higher values than Jaunsari females at 8 to 15 to 17 years in biacromial breadth and at 8, 9, 10 to 16 years in bicristal breadth.

• Jaunsari females exhibits higher values than Garhwali females in circumferences at 12, 14 to 18 years in mid upper arm circumference, at 11-13 and 15, 16 and 18 years in waist circumference whereas in hip circumference Jaunsari females exhibit lower values at all age groups than Garhwali females.

• Skinfold shows that Garhwali females exhibits higher values at 8 to 12, 14 to 17 years in Tricep skinfold, at 8 to 12, 16 and 17 years in Calf skinfold and in Sub- scapular skinfold at 8 to 10, 14, 16 and 17 years.

• It is observed in case of Waist hip Ratio that out of 664 Garhwali females 409 (61.60%) are in Normal range (0.70 - 0.80), 202 (30.42%) are at moderate risk (0.81-0.85) and 54 (8.13%) are at high risk (0.85 or above). Whereas among Jaunsari females out of total 655 (8 to 18 years) 237 (36.18%) are in Normal range, 298 (45.50%) are at moderate risk and 120 (18.32%) are at high risk. After comparison of Garhwali and Jaunsari Rajput females it may be concluded that waist hip ratio in Jaunsari females (18.32%) are more prone towards high risk for developing central obesity than Garhwali females (8.13%).

• Garhwali females have greater Body Mass Index than Jaunsari females at all age groups. After comparison of body mass index of present study with NCHS and WHO body mass index, it is observed that according to WHO criteria, among Garhwali Rajput females total 441 (66.41%) are in normal BMI range, 142 (21.38%) are underweight, 9 (1.35%) are below underweight (below 3rd percentile), 60 (9.04%) are overweight and 12 (1.80%) are obese.

• In case of Jaunsari Rajput females according to WHO it is observed that total 435 (65.41%) females are in normal BMI range, 166 (24.96%) females are in underweight category, 19 (2.85%) females are below 3rd percentile.39
(5.86%) females are in overweight BMI range and (0.90%) females are in obese category.

- According to NCHS criteria among Garhwali females 65.81% are normal, 23.19% are underweight, 7.08% are overweight and 2.72% are below 3rd percentile 1.20% are obese. Whereas among Jaunsari females 64.73% are normal, 27.63% are underweight, 4.27% are below 3rd percentile, 3.05% are overweight and 0.30% are obese.

- Rate of growth among Garhwali females occurs between 8-9 years for Hand length and Sub scapular skinfold, between 9-10 years for foot length and tricep skinfold, between 10-11 years for Body weight, Height, Total arm length and body mass index, between 11-12 years for sitting height, upper arm length, fore arm length, lower leg length, total lower extremity length, thigh length, biacromial breadth, waist circumference, hip circumference and calf skinfold, 12-13 years for bicristal breadth, mid upper arm circumference and between 16-17 years for waist hip ratio.

- Rate of growth among Jaunsari females occurs between 9-10 years for lower leg length, between 10-11 year for foot length, waist circumference, hip circumference, tricep skinfold and sub scapular skinfold, between 11-12 for body weight, height, total arm length, upper arm length, hand length, between 12-13 years for sitting height, fore arm length, total lower extremity length, thigh length, biacromial breadth, bicristal breadth and calf skinfold, between 13-14 for mid upper arm circumference and body arm index and between 14-15 years for waist hip ratio.

- Percentile Distribution of Garhwali and Jaunsari Rajput females for weight shows that maximum 41 (67.21%) and 37 (61.67%) subjects comes under normal range (75th-25th) of percentile at 10 years respectively and minimum 23 (40.35%) at 9 years and 24 (37.51%) at 12 years fall under normal range.

- Among Garhwali Rajput females percentile distribution for height results that maximum individuals, 30 (49.18%) at 16 years and 30 (53.57%) at 17 years falls under normal range (75th-25th) of percentile respectively. Minimum
individuals, 19 (32.20%) at 12 and 16 (27.12%) at 10 years fall under normal range of percentile respectively.

- In case of percentile distribution among Garhwali and Jaunsari Rajput females for WHR maximum of 39 (60%) subjects at 10 years and 60 (100%) subjects at 8 years fall under normal range (75th-25th) of percentile respectively. Minimum of 26 (43.33%) subjects at 13 years and 25 (42.37%) subjects at 10 years fall under normal range of percentile respectively.

- Percentile Distribution of Garhwali and Jaunsari Rajput females for BMI shows that maximum of 37 (63.79%) subjects at 8 years and 38 (61.29%) subjects fall under normal range (75th-25th) of percentile respectively. Minimum of 27 (41.54%) subjects at 10 years and 29 (45.31%) subjects fall under normal range of percentile respectively.

- It is observed that there are marked variations in anthropometric measurements at different age groups among Garhwali and Jaunsari Rajput Females (at 5% level of significance). Only Body weight is significant at all age groups whereas height is significant from 8 to 12 years and at 18 years of age. Sitting height, total arm length, upper arm length, total lower extremity length, foot length, hip circumference and tricep skinfold are significant at 8 - 10 years. Hand length and mid upper arm circumference are significant at 8 - 11 years while biacromial breadth is significant at 8-12 years of age whereas thigh length and subscapular skin fold are significant at 8-13 years of age. Fore arm length is significant at 8-14 years and at 18 years. Bicristal breadth is significant at 8 and 10-12 years. Tricep skinfold is significant at 17-18 years whereas hip circumference is significant at 15-17 years. Waist hip ratio is significant at 9-13 years whereas body mass index is significant at 11-15 years. Lower leg length, waist circumference and body mass index are significant at 8 year. Waist circumference, calf skinfold and body mass index are significant at 9 years of age.

- Calf skin fold is significant at 10 years. Lower leg length is significant at 11 years. Sitting height, upper arm length ,total lower extremity length, lower leg length , waist circumference and hip circumference are significant at 12 years.
Sitting height, hand length, total lower extremity length, waist circumference, waist hip ratio is significant at 16 years. Calf circumference are significant at 13 years. Waist hip ratio is significant at 15, 16 and 18 years. Total lower extremity length is significant at 16 years, while thigh length is significant at 16 and 18 years. Fore arm length and lower leg length are significant at 18 years of age where as mid upper arm length is significant at 17 years. Fore arm, waist circumference, calf skin fold and subscapular skinfold are significant at 17 and 18 years.

- Mean age at Menarche is observed at 12.70 years in Garhwali girls in comparison to 13.25 years in Jaunsari girls.

- Analysis results that sitting height shows highest correlation with height in maximum age groups among both populations. Whereas thigh length shows lowest correlation in maximum age groups among Garhwali and sub scapular skin fold shows lowest correlation in maximum age groups among Jaunsari females.

The present study has highlighted that there is no such prevalence of obesity or overweight. Both populations are sharing same environment but still there are marked population difference.