Chapter – IV

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In the present cross-sectional study, an attempt has been made to study the growth pattern and nutritional status of the Ahir and the Labana children. The study was carried out in the rural areas of Haryana and Himachal Pradesh. As many as 830 unrelated school going children aged between 6 and 10 years were selected from these two communities. Out of 830 children, 420 children (209 boys and 211 girls) belonging to Ahir community were selected from four panchayat villages namely Seehma, Khampura, Khaspur and Deroli Ahir, which fall in Ateli Block, Narnaul tehsil of Mahendragarh district in the state of Haryana. Similarly, the data on 410 Labana children (216 boys and 194 girls) were collected from the villages of Kolar, Suckchainpur, Dhaulakuan, Gujjar Colony and Bharapur falling under Sirmour district; Haripur Sandoli, Billanwali, Nanowal Kheda and Baddi villages falling under Solan district in the state of Himachal Pradesh. The children belonged to the family of marginal farmers and agricultural labourers. The Ahir belongs to semi arid zone which experiences hot summer and cold winter, while the Labana belongs to the lower reaches of Himachal Pradesh with moderate summer and cold winter. By and large both are vegetarian in their dietary habits.

While conducting the field work the techniques and methods employed are that of Weiner and Lowrie (1969) and Singh and Bhasin (1989). In total 25 different anthropometric measurements, as mentioned below, were taken on 830 children.

1. Weight
2. Stature
3. Height Tragus
4. Sitting height
5. Biacromial diameter
6. Biiliocrisal diameter
7. Total arm length
8. Upper arm length
9. Fore arm length
10. Hand length
11. Head circumference
12. Chest circumference
13. Mid upper arm circumference
14. Calf circumference
15. Skinfold at triceps
16. Subscapular skinfold
17. Skinfold at biceps
18. Head height
19. Head length
20. Head breadth
21. Nasal length
22. Nasal breadth
23. Upper facial height
24. Total facial height
25. Lower extremities length.

The emergence of permanent teeth was recorded to ascertain the growth of the children. Nutrition deficiency signs with the following symptoms were also examined following the techniques of Jelliffe (1966) and Latham (1979).
1. Pigmentation of skin
2. Angular Stomatitis
3. Dry scaly skin
4. Discoloured hair
5. Flag/Coarse hair
6. Spongy bleeding gum
7. Yellowish teeth
8. Pale conjunctiva
9. Yellow colour at the base of the nails

The analysis of the above measurements reveals the following results and facts.
1. The mean values of all anthropometric measurements on Ahir and Labana children gradually increases with the advancement of age except for skinfold thickness. The magnitude of growth was higher in composite, linear and
transverse body dimensions than the skinfold, face and head measurements. Several studies on physical growth in different populations have showed similar tendency with the increase in age, i.e., the acceleration in all the physical traits except for skinfold (ICMR, 1984; Reddy and Rao, 2000; Bhaskara Babu, 2005; Rao Balaji, 2005; Singh, et. al. 1987; Manocha, 2004; Gaur, 2002, 2003; Sharma, 2009).

2. It was observed that the mean values of the array measurements such as weight, height, tragus, sitting height, total arm length, biacromial diameter, biliocristal diameter, facial measurements, calf, head and chest measurements showed better growth among the Ahir boys than to Ahir girls, Labana boys and girls. The Labana boys were heavier, taller and with greater body size than to Labana girls till 9 years age, by then the Labana girls accelerated their growth and surpassed Labana boys indicating the onset of juvenile growth spurt, but fall short of Ahir boys. Ahir girls finished at the bottom. These sex differences are mainly due to the difference in timing and intensity of their respective growth spurt marching towards onset of adolescent growth. The male adolescent spurt occurs later than female (Tanner, 1962).

3. The Ahir boys are favourably placed than Ahir girls. Though the growth is independent for each sex but, the choice of preference over the male child is noticed in the field which perhaps might have given a chance for ignorance of girl child in supplementing balanced diet, a probable reason for less growth.

4. The total gain in weight and height of the Ahir boys from 6 – 10 years age is 10.10 kg and 26.27 cm respectively. Among the Ahir girls the maximum gain in weight and height for 5 year period is 7.63 kg and 20.71 cm, which clearly indicates that the Ahir boys are heavier and taller than Ahir girls. While the weight and height gain by the Labana boys for the corresponding age is 7.9 kg and 19.3 cm respectively. In case of Labana girls it is 8.69 kg and 22.11 cm, indicating that the girls are heavier and taller than Labana boys, which is the probable indication of onset of juvenile spurt. While the Labana boys and girls fall short of Ahir boys, it indicates that the children of higher reaches are shorter than the children from plain. The results are in corroboration with the earlier findings of Singh and Sidhu (1981), Singh (1970), Singh (1980), and Gaur (2002). The Labana belong to low altitude region of Himalayas and show signs of lighter and short stature than Ahir boys and girls. This clearly indicates that
children from plain area grow faster than high altitude children. Earlier studies on some altitudinal populations have also shown that the growth at altitude is prolonged and delayed (Singh, 1978; Singh, 1970, Malik and Singh, 1978, Pawson, 1977, Kaul, 1971 and Singh and Sidhu, 1981a). However, Labana girls accelerated their growth at 9 years moving ahead of Labana boys indicating the onset of juvenile growth spurt among them. This indicator is not seen in Ahir girls. The reason behind this has already inferred at the preceding point.

5. One more interesting feature found among the Labana children was that they showed higher mean values for skinfold measurements intermittently at different ages, though the Labana children showed lesser mean values for other anthropometric variables than the Ahir children, indicating more body fat mass, thereby resulting into accumulation of fat beneath the skin, a feature of adaptation found among people inhabiting the higher reaches. The comparative study on different populations like Dangi of Rajasthan (Mandal and Nanda, 2009); Poundra Kshatriya of West Bengal (Devi and Bhattacharya, 2009) and Mala of Andhra Pradesh (Saheb and Ramana, 2009) also showed lesser mean values for skinfold thickness in comparison to Labana children. However, the Labana children fall short of Yadav children of Uttar Pradesh (Sharma and Joardar, 2009).

6. The height gain in body trunk and lower extremities also showed higher growth among Ahir boys when compared to Labana boys. This parameter also shows that the linear growth is more in the children from plain areas than from higher reaches. The results are in conformity with Singh and Sidhu (1981). The only difference seen in girls is that they are taller from 9 year onwards. As discussed elsewhere the girls showed the signs of onset of juvenile spurt, which is not seen in Ahir girls.

7. Relatively higher values of standard deviation and co-efficient of variation were noticed in skinfold thickness, face and head measurements which indicates wider range of individual variation. Moderate values of SD and CV are found for composite, linear and transverse measurements indicating lesser variation among the individuals. The values were fluctuating at different age groups.

8. It was observed that different body parts grow at different rates and at different times. The present study is in conformity with the results of Bowditch (1891), Peckham (1881), Roberts (1878), who studied growth towards the later part of the nineteenth century and summarized that the growth of weight and stature are asymmetrically distributed during different periods of life. Boas (1892) showed that these asymmetries were due to the changing rate of growth. Thompson

9. The descriptive analysis of distance and velocity curves for each body segment of both sexes and communities show different growth spurts at different age groups. It is evident from the distance curves that in most of the cases, difference between curves was higher with the advancement of age. The present finding is in conformity with the results reported by earlier scholars Bhowmick (1993), Dharma Rao and Busi (1994, 1995, 1996, 1997, 1998), Reddy and Rao (2000), Talwar and Maninder (2001), Badaruddoza (2001), Gaur et. al. (2002, 2003), Manocha (2004) Busi and Dharma Rao (2003), Aarthi Sankala et. al. (2004), Rao Balaji (2005), Suthroy (2005), Sharma (2009), Urade and Chakravarthy (2012). The velocity curve show higher rate of growth for both the sexes between 8 and 9 years for majority of the body segments. Both the sexes showed distinct peaks for different body dimensions at different age groups ranging from 8 to 10 years, which may probably indicates preadolescent growth. Since the study is limited to preadolescent stage to find out mid-childhood or juvenile growth spurt, a short-lived acceleration at about 7 – 8 years of age has been emphasized by a dip in velocity before puberty following the methodology reported by Stanley J. Ulijaszek et. al. (1998), and Lejarraga (2002). From the result the difference in weight and height gain and loss is clearly reflected in the velocity curves at successive age groups for both boys and girls of the Ahir and Labana. It is seen that the dip in velocity is at 7 – 8 years in girls and 9 years in boys.
10. The shapes of the distance curve for weight, stature, height tragus, sitting height, biacromial diameter, biiliocrisal diameter, total arm length, upper arm length, fore arm length, hand length, chest circumference, mid upper arm circumference, calf circumference are strikingly similar between Ahir and Labana boys and girls. The shapes of distance curve for Ahirs start almost at the same point with a spindle shape divergence between 7 – 9 years before they settle for a parallel trend widely separated each other. In most of the curves slowing down of the velocity at the age of 8 years for girls and for boys it is at 9 years. The distance curves of Labana children almost run parallel between the curves of Ahir boys and girls. While the Labana girls surpass boys from 9 years onwards. Consequently the velocity curves of all the above characters among Ahir boys show similar pattern i.e. an inverted tick mark (\(\uparrow\)) gradually lowering of velocity upto 9 years before increasing at 10 years) and in Labana boys the velocity curve shows peak growth at 8 years and it slides down by 9 years and then it accelerates in 10 years. While, in Ahir and Labana girls the curve takes the shape of an inverted ‘S’ shape (\(\downarrow\)) with a spurt in the velocity between 8 and 9 years and a dip before and after these two ages the rate of growth. The pattern observed for longitudinal, breadth and circumference measurement does not reflect in skin fold measurement. The shapes of skinfold measurement are skewed. The distance curve for facial measurement is almost flat and runs parallel each other.

11. The head grows first and approaches its adult size much earlier than the other body parts. Tanner (1962) calls this as cephalo-caudal gradient and attests that ‘in man, it (cephalo-caudal gradient) implies that the head is advanced over the trunk and the trunk as a whole over the limbs’. In the present study it was found that by the age of 10 years, the growth of head length, head breadth and head circumference had attained its maximum growth showing broader head breadth in Labana children than the Ahir children and lengthier head length in Ahir children than the Labana children.

12. Existence of significant relationship between some of the anthropometric traits in Ahir and Labana children infers that all these anthropometric traits are equally involved in the growth process and different parts of the body grow differentially but they grow proportionately and simultaneously.
13. Rohre’s index; sitting height: stature; Biiliocristal diameter: biacromial diameter; upper extremities: lower extremities gives a clear indication that various body segments grow proportionally at different rates so as to reach a definite body form and its structure with only difference in rate of growth among boys and girls, maintaining their respective period of adolescent attainment.

14. For cephalic index majority of Ahir boys and girls fall under hyperdolichocephalic and dolichocephalic head. The Labana children have showed dolichocephalic and mesocephalic head. Relative biacromial breadth index showed both Ahir and Labana children falling under normal and medium shoulder with a higher percentage of normal shoulder children among Ahirs. Relative biiliocristal breadth index showed almost all the children falling under normal pelvic category. The reason behind this is the children are yet to reach their adolescent age. Relative upper and lower extremities index showed that almost all the children are falling under short arm and short legged category as they are yet to reach their onset of adolescent period.

15. Assessment of nutritional status based on anthropometric measurements showed various results like under weight for age or weight deficient classification and the findings are: the sex distribution of normal children is in favour of boys among both the studied groups. Between 80 – 85 per cent of Labana and Ahir boys are falling in the category of normal and grade - I malnourishment. Therefore, less percentage of Ahir and Labana girls (70 – 75 per cent) are falling in the normal and grade - I category depicting boys are better nourished than girls. Inter group comparison showed that more percentage of normal children were found in Ahir boys than the Labana boys, while in deficient categories like grade - II to IV the percentage of malnourishment is more in Labana boys when compared to the Ahir boys.

16. Height deficient classification showed 79 – 82 per cent of Labana and Ahir boys are falling in the category of above normal and normal. Higher percentage of Labana and Ahir girls (86 – 93 per cent) are falling in the above normal and normal category indicating girls are less deficient for height than boys. Inter group comparison showed that more percentage of above normal and normal children were found in Ahir boys than the Labana boys; in deficient categories like mild retardation the percentage of malnourishment is more in Labana boys when compared to the Ahir boys.
17. The BMI values showed increasing trend in the proportion of individual towards normal and decreasing trend of thinness from lower to higher age groups with minor fluctuations. Similar observations were reported by various studies made on communities namely Lushai, Oraon, Yadav, Kaibarta, Ghase Mali, Mala and Dangi (Sharma, 2009). The distribution of thinness shows variation for different ages indicating malnutrition at that particular age. Among both the groups and sexes, Labana boys and girls showed more frequency of normal and over weight than the Ahir boys and girls. The higher value in Labana may be due to higher weight proportion to the height. The overall better growth in Labana girls is noticed, which may be due to onset of juvenile catch up growth. The magnitude of increase in BMI is higher in girls during menarche age (Vishweshwar Rao et. al., 1991).

18. For mid upper arm circumference in both the groups, the distribution of normal children is more among boys and mild, moderate and severe malnourished children are more among girls. Intergroup comparison showed that the Labana boys and girls are having more mid upper arm girth than Ahir boys and girls which had clearly reflected in the classification depicting higher percentage of normal boys and girls. The deposition of fat reserves in the subcutaneous layers of the skin is also an adaptation of individuals inhabiting in higher reaches; the same is clearly seen in Labana children when compared to the Ahir children who lives in the plain areas.

19. For upper arm muscle area, upper arm fat area, percentage of body fat and sum of skinfold at triceps, subscapular and biceps – the mean values fluctuated for different age groups in both the groups and sexes. The Labana girls showed higher mean values for all the ages over Labana boys and Ahir boys and girls. The reason behind the higher mean value has already been discussed at various levels, i.e., possibility of onset of juvenile spurt among Labana girls and an adaptive mechanism of higher reaches to acclimatize in the colder climate. The upper arm fat area also showed similar higher trend. UAMA and UAFA among girls may be attributed to continuous accumulation of fat throughout childhood. The present finding is in conformity with earlier studies of Frisancho (1974), Reddy and Rao (2000). The Labana girls showed higher percentage of body fat than Labana boys, Ahir boys and girls. The Ahir girls also showed higher mean values than Ahir boys. This indicates higher accumulation of fat in girls than to boys during childhood. The sum of STSB showed varied fluctuations at different age groups in both the sexes.
20. Ahirs boys showed more number of permanent teeth than the Labana boys. While the Ahir girls showed more number of permanent teeth than the Labana girls for the ages 6 and 7 years for the rest of the ages (8, 9 and 10 years) the Labana girls showed more number of permanent teeth than the Ahir girls. The present study when compared with the United Sates children (NCHS, 1974), the Ahir children showed more number of permanent teeth for all the ages than the U. S. boys, while Labana boys showed more permanent teeth for the ages 7, 8, and 9 than the U. S. boys. The Labana and Ahir boys and girls also showed higher growth in the eruption of permanent teeth when compared to the Jat children of Haryana except for 6 years (Kaul, 1979). The Yadav children of Uttar Pradesh (Sharma and Joardar, 2009) and Dangi children of Rajasthan (Mandal and Nanda, 2009) showed very high number of permanent teeth for all ages and sexes which are incomparable.

21. The general health condition of the Ahir and Labana children revealed that around 70 per cent of them were of satisfactory, 15 per cent of Ahir children and 10 per cent of Labana children were found to be weak and the rest of the children were reported as normal.

22. The Labana and Ahir children do not show any gross clinical signs and nutritional deficiencies. Nevertheless, Ahir children showed some signs of nutritional deficiencies which can not be taken into consideration as the Ahir boys showed better growth for most of the anthropometric variables than the Labana boys. While Ahir girls also showed some signs of deficiencies like discoloured hair and flag / coarse hair which are of temporary in nature and can overcome by supplementing balanced diet. Around 40 per cent of Ahir children showed yellowish teeth which might be because of prevalence of dental fluorosis.

23. Bio-social factors like birth order / parity of the children were analysed and found that most of the variables represent higher mean values for the second, third and the fourth birth order than the children who were first born to their parents. For family size the Ahir data were analysed as they showed sizeable data under each category. For all the studied measurements except upper facial height, total facial height, mid upper arm circumference, head breadth, nasal length, head circumference and skinfold measurement, BMI and head height the
mean values showed higher growth in the medium large family. For head breadth, nasal length, head circumference and skinfold measurement and BMI the mean value is high under medium family size. Upper facial height, total facial height, mid upper arm circumference and head height the mean values are high in large family. The Labana data could not be analysed as 98 per cent of the children were falling under medium family.

24. The comparison of various anthropometric variables of Ahir and Labana children with world standards revealed that the composite and linear measurements fall short of NCHS and WHO standards. The mean weight of the children fall below the 10th percentile of the U. S. children (NCHS). For height the 95th percentile of the children falls just above the 50th percentile of the NCHS standards. The shortfall may be mainly because of comparatively low standard of living and lack of balanced diet resulted in failure to achieve their maximum growth potential. Nevertheless, the Ahir and Labana children showed better growth when compared to the Indian standards of ICMR pooled data and on par growth with ICMR socio-economic class I and Punjabi data. Children belonging to the same stock like the Ahir of Haryana (present study), the Yadav of Uttar Pradesh (Sharma and Joardar, 2009) and the Dangi of Rajasthan (Mandal and Nanda, 2009) are competing with each other in expressing their higher growth for different variables among others. The Labana of Himachal Pradesh (present study) are no less in the race, showing better growth trend among girls which might perhaps be because of onset of juvenile growth spurt. However, the Labana boys had stepped back in the race letting the Ahir boys in gaining better growth.

4.2 Conclusion

Keeping in view the parameters of the World Health Organisation (WHO) the following suggestions can be taken into consideration to improve the health and nutritional status and to overcome the malnutrition that is prevailing in the villages as a whole:

- As the ICMR, 1972 anthropometric data is considered as national standards, it is of more than 41 years old so there is a need to timely update the data as WHO does.
As suggested by Tanner *et al.* (1965), individual growth standards for each endogamous population is required because of the genetic determination of growth pattern and their modification by particular environment and nutritional habits of such populations. Anthropometric studies are to be undertaken at a large scale targeting the pre-school, school going and adolescent children covering all endogamous groups irrespective of caste and creed. The outcome of the study will definitely help in improving the existing nutritional programmes that are being implemented by the Government of India and respective State Governments and more schemes can be implemented in the vulnerable areas where malnutrition / under nutrition is noticed.

- Strict implementation of various schemes at *Anganwadi* centres and mid-day meal programme so that school drop outs can be reduced considerably. Addition of recommended dietary allowances is quite essential in the noon meal programmes.

- Intervention programmes should be carried forward by the government agencies with the help of local administrative authorities to monitor various health related problems. Under nourished children especially from vulnerable groups should be targeted and proper management and monitoring of various developmental programmes should be looked into so that the affected children get proper treatment at proper time.

- Intergroup comparison and betterment of sufficiency of food based on each communities growth can be monitored *vis-à-vis* sexual difference (boys to girls) and gender bias if any can be highlighted.

- Creation of irrigation in agricultural sectors so that they can produce variety of food grain, green vegetables and fruits which will help in improving socio-economic status of the family by means of generating employment within region and groups.

- Pure and safe drinking water facilities are to be made available by providing more tube wells and well treated water supply.

- Finally it concludes to focus some light for the betterment of the community especially programmes related to nutrition, health and hygiene and growth comparison in respect of national and international (WHO) standards.
- The roads are to be properly laid in the villages with adequate drainage system without letting of sewage / waste water into the lanes of the villages which acts as a breeding place for mosquitoes and flies resulting in the spread of Malaria, Typhoid, cholera and other water borne diseases.
- Strict implementation of ban on open defecation.
- To monitor cent per cent coverage of children under various immunization schemes irrespective of poverty status.
- Educated members of the community can be trained as nutritional and health workers to campaign awareness programme on nutrition and health in the rural areas to aim at good health for all and good society for tomorrow’s better development of the nation. This would be possible only when every individual / parent should take responsibility to nurture their offsprings in a better way so that a strong nation can be built as we all know ‘Neti Balale Repati Pourulu’ (today’s children are tomorrow’s citizens).

A better growth rate may be observed if the above mentioned points are taken care of. Aboveall, if it is seen that the literacy level of the population is achieved to the maximum extent, it may altogether give a phase lift in their living standards and general awareness towards health and hygiene.