The criteria of classifying the population into various socioeconomic groups vary from country to country and even in various regions/states in the same country. Economic conditions of Northern India like Punjab, Haryana and Delhi is different from that of Eastern (Bihar and West Bengal) and Southern (Tamil Nadu) states of the country.

In the past, in India, a classification of the socioeconomic groups was done by the ICMR (1956-65, published, 1984) and the Central Statistical Organization (1962). In addition, Kuppuswamy (1962) and Prasad (1970) followed their own criteria for classifying the socioeconomic groups. The criteria by these workers were laid down about 20 years back and as such do not apply to present economic conditions of Northern India where income per capita has greatly increased. There were certain shortcomings in these criteria which have been discussed by the worker on page 256. To remove the shortcomings the author had to devise his own criteria. Because of the possibility of overlap the worker has only taken upper and lower socioeconomic groups in the present investigations.
Socioeconomic Classification

Author has devised his own criteria somewhat arbitrarily to identify the upper and lower socioeconomic groups.

Upper socioeconomic group

A person was considered to belong to this group if the following criteria were fulfilled:

1. Income Rs. 3000/- p.m. or more
2. Family size up to 5 members
3. Education of adults graduation, and in adolescents above 6th standard according to age.

Lower socioeconomic group

The criteria were:

1. Income below Rs. 600/- p.m. (Basic)
2. Family size above 5 members
   - An income of Rs. 100/- p.m. per member was added to the total basic income of the family, which had more than 5 members.
3. Education below primary, including illiterate persons.

These subjects were not included in this study, in which parents spent substantial amount of money on
self indulgence and other vices or were sending money outside the family to support other dependents.

Subjects from the middle socioeconomic groups were not included in this study, as there was no hard and fast lines to separate this group from the upper and lower socioeconomic groups. To obviate overlap, the study was limited to the higher and lower socioeconomic groups.

**Socioeconomic classifications**

The ICMR (1984) divided the population into 6 socioeconomic classes as follows: Class I had an income of Rs. 1000/- p.m. or above and were high government officials, professionals and rich businessmen; Class II had an income between Rs. 500-1000/- p.m. and had achieved good nutritional and health status; Class III had an income between Rs. 200-500/- p.m.; Class IV had an income of less than Rs. 200/- p.m. and were clerks, inspectors and mechanics etc; Class V had an income ranging between Rs. 100-200/- p.m. and were skilled workers and artisans; Class VI had an income of less than Rs. 100/- p.m. and were unskilled labourers and domestic servants. The ICMR (1984) did not make any mention regarding education and family
size. However, the present worker has basically taken these criteria into account while defining the upper and lower socioeconomic groups. The ICMR conducted their study in 1956-1965 but published the work in 1984. Since the price index has increased at least five times from 1966 to 1987-88 (India, 1987), Rs. 500/- (lower limit of Class II) in 1966 are equivalent to Rs. 2500/- p.m. in 1987-88. The lowest two of 6 income groups of the ICMR had a family income below Rs. 200/- p.m. which now would mean about Rs. 1000/- p.m. To be on the safer side the worker included those persons in the lower socioeconomic group who had a family income of less than Rs. 600/- p.m.

The Central Statistical Organization (1962) divided the population into 4 social (socioeconomic) groups, which were also based upon occupation and income of an individual. In this classification, Class I included professional persons and high government officials who had an income above Rs. 800/- p.m., whereas Class IV included unskilled labourers who had a monthly income between Rs. 50-150/- p.m. This classification also seems to be unsatisfactory because it does not take into consideration either the education of a person or the number of mouths to be fed by him/her.
Kuppuswamy (1962) divided socioeconomic classes into five categories, I upper, II upper middle, III lower middle, IV upper lower and V lower. He took three factors into consideration namely, education, occupation and income of a person. Each factor was given a score (weight), a total of the scores gave the socioeconomic status of a person. In 1975, price index became doubled of what it was in 1962. Kuppuswamy, therefore, doubled the monthly income of each of the five groups for including them in a particular socioeconomic class e.g. in 1962 a person having an income of Rs. 1000/- p.m. was included in Class I, but in 1975 the minimum income of a person to get included in the group was Rs. 2000/- p.m.

Classification given by Prasad (1970) also seems to be unsatisfactory for the purpose of the present worker. He divided population into five social classes, the fifth being those of petty agriculturists having per capita monthly income of less than Rs. 30/-, while Class I included professional workers and well-to-do traders and agriculturists having per capita monthly income of Rs. 300/- and above. He took into consideration neither the education nor the number of dependents in the
family. Education of the head of the family play an important part in classifying a person in a particular socioeconomic class. The income of a person may be that of upper socioeconomic group, but in case he/she is uneducated he can't understand the value of nutritive food and healthy living. It has been seen in this area that people with good income still suffer from caloric malnutrition (Udani, 1975). In the present classification, the minimum education has been kept graduation for upper socioeconomic group. It is presumed that a graduate would know the importance of good nutritive food and healthy living.

It is obvious if a person is placed in a upper socioeconomic group, his income will be greatly diluted if the number of mouths to be fed are increased. Therefore, the maximum number has arbitrarily been placed at five in the upper socioeconomic group and more than five in the lower socioeconomic group.
Relationship between weights, skinfold thicknesses and circumferences

Upper socioeconomic group

Males

A comparison of graphs 2, 18 and 22 showed that from 12 to 14 years the thicknesses of various skinfolds namely triceps, subscapular, abdominal, iliac-crest, thigh and medial calf remained almost stationary, while the relevant circumferences viz. upper arm, chest, waist, hip, thigh and calf and weight went on increasing. From 14 years onwards till the last adult age-group of 40-49 years the skinfold thicknesses of the upper body namely triceps, subscapular, abdominal and iliac-crest increased tremendously pari passu with an increase of relevant circumferences viz. upper arm, chest, waist, hip and body weight. However, the skinfold thicknesses of the lower limbs namely that of thigh and calf increased moderately from 14 to the last age-group of 40-49 years, this increase corresponds to an increase in the relevant circumferences.
The above mentioned observations showed that—

1. From 12 to 14 years, the increase in weight and circumferences were not due to an increase in the thicknesses of the skinfolds. This increase in body weight was possibly due to an increase in height. The circumferences increased possibly due to an increase in the lean body mass including the tone in the muscles.

2. From 14 to 17 years, an increase in the thicknesses of skinfolds contributed to an increase in weight and the circumferences.

3. From 17 years to the last adult age-group of 40-49 years the increase in weight could be possible due to a great increase in the thickness of subcutaneous fat as shown by a tremendous increase in skinfold thicknesses. Other factors, as mentioned above, would also increase the weight and circumferences.

Females

In adolescent females from 12 to 17 years the skinfold thicknesses increased considerably as compared to weight and circumferences (graphs 2, 19 and 23). It appeared that the increase of skinfold thicknesses
LOWER MALES

MEAN SKINFOLD THICKNESSES IN mm.

ILIAC-CREST
ABDOMINAL
SUBSCAPULAR
THIGH
MEDIAL CALF
TRICEPS

AGE IN YEARS

GRAPH-20
MEAN SKINFOLD THICKNESSES IN mm.

LOWER FEMALES

ILIAC-CREST
ABDOMINAL
SUBSCAPULAR
TRICEPS
MEDIAL CALF
THIGH

AGE IN YEARS

GRAPH -21
contributed a greater part in the increase of the weight and circumferences, which was contrary to what had been seen in the males. This might be due to lack of exercise in the females. In the adult females, however, these three parameters corresponded with one another as in the males.

**Lower socioeconomic group**

**Males**

In adolescent males between the ages of 12 and 15 years the skinfold thicknesses did not increase as compared to weight and circumferences (graphs 2, 20 and 24). However, from 15 years till the second adult age-group of 30-39 years the skinfold thicknesses of the upper body namely triceps, subscapular, abdominal and iliac-crest increased simultaneously with an increase in body weight and corresponding circumferences viz. upper arm, chest, waist and hip. While skinfold thicknesses of the lower limbs namely those of thigh and medial calf decreased, the corresponding circumferences increased. In the last adult age-group of 40-49 years, the skinfold thicknesses both of the upper body and lower limbs
MEAN CIRCUMFERENCES IN cm.

- Calf
- Upper Arm
- Thigh
- Waist
- Hip

Upper Males

18-29 30-39 40-49
MEAN CIRCUMFERENCES IN cm.

AGE IN YEARS
15 16 17 18-29 30-39 40-49

UPPER ARM  THIGH  WAIST  CHEST  HIP

GRAPH-23

UPPER FEMALES
decreased pari passu with weight and circumferences, except the chest circumferences which remained almost stationary.

Above mentioned observations showed that-

1 From 12 to 15 years, the increase in weight and circumferences were not due to increase in skinfold thicknesses. This increase possibly was due to factors summarised earlier.

2 From 14 years till the second adult age-group of 30-39 years, an increase in the thicknesses of skinfold of upper body and increase in lean body mass of lower limbs must have contributed to an increase in body weight and circumferences.

3 In the last adult age-group of 40-49 years, skinfold thicknesses decreased pari passu with weight and circumferences. However, the chest circumference remained stationary as the latter depended on lung capacity which normally does not decrease, except in old age.

Females

In adolescent females between the ages of 12 and 17 years the weight increased simultaneously with increase in all the skinfold thicknesses and relevant circumferences.
From 17 years to the first adult age-group of 18-29 years, all the skinfold thicknesses decreased along with decrease in weight and circumferences. From first to the last adult age-group of 40-49 years, the weight, skinfold thicknesses and the corresponding circumferences remained almost the same.

Above mentioned observations showed that—

1. From 12 to 17 years, an increase in the thicknesses of skinfolds contributed to an increase in weight and the circumferences.
2. From 17 years to the first adult age-group of 18-29 years, the decrease in weight was due to decrease in all skinfold thicknesses and the circumferences which seems to be due to repeated child birth and poor diet.
For the purpose of discussion the comparison of the present work with other workers can be made under two headings:

1. Studies already conducted in India
2. Studies done outside India.

1. Studies conducted in India

   I. Height and Weight

   Sharma and Kaul (1970) have measured height, weight and four skinfold thicknesses (triceps, subscapular, suprailiac and calf) of 325 Punjabi male subjects between the ages of 5 and 17 years, who belonged to "lower-middle" (which was equivalent to Class III of socioeconomic classification of ICHR, 1984) and "lower" (equivalent to Classes IV and V of ICMR, 1984) socioeconomic groups.

   Their division of socioeconomic groups into "lower-middle" and "lower" was based on monthly income, number of family members, educational background of the parents and the type of the school attended. It was not clear from their paper that as to how the last three criteria affected the socioeconomic status of the subject. Further, the number of family members in each group was not given.
In the study, conducted by Sharma and Kaul (1970), the mean body height of the males between the ages of 12 and 15 years belonging to lower socioeconomic group was 5.5 to 10.5 cm shorter than that observed in the present study. However, at the age of 16 years, the height was almost the same but at 17 years the males in the earlier study were found to be taller by 3.4 cm than in the present investigation (Table 76). The mean body weight taken by Sharma and Kaul (1970) of the males between 12 and 15 years was lighter by 2.0 - 5.5 kg than those belonging to lower socioeconomic group in the present study. However, the mean weights in the earlier study were found to be heavier by about 1.0 kg at the age of 16 years and 4.5 kg at the age of 17 years.

Mean measurements of the height and weight of adolescent (12-17 years) and adult (18-21 years) subjects as noted in the present investigation were compared with those given by the ICMR (1984). The upper socioeconomic class of the present work was compared with those of Class I of the ICMR (1984).

The present subjects were taller and heavier than those included in the ICMR (1984) e.g. at 17 years, subjects in the present report were found to be taller.
by 6 cm (males) and 5.0 cm (females) and heavier by 3.0 kg (both males and females) than those studied earlier by the ICMR (Tables 76 and 77). The ICMR (1984) conducted the study in 1956-65. It appears that during this period of 20-30 years, the secular trend has changed for the better due to better nourishment, better education and better living conditions. This positive secular trend which is seen in developed countries like U.S.A., Canada, U.K. and Scandinavians seems to be present in some parts of India like Chandigarh zone.

The measurements taken by the present author in the subjects belonging to the lower socioeconomic group when compared with those of Class VI of the ICMR (1984), also show that both male and female subjects included in the present investigation were taller and males were heavier than those studied by them. It was seen that secular trend which was present in subjects of upper socioeconomic group was also present to certain extent in the subjects of lower socioeconomic group. However, the weight of the females has not changed during the last 30 years. It is difficult to say why the secular
trend which is evident in increase in the height of females has not affected their weight.

Vijayraghavan, Singh and Swaminathan (1971) measured height and weight in a sample of 9000 children of both sexes between the ages of 5 and 16 years, out of which 7000 belonged to well-to-do families and the remaining to families of low income group. Children of well-to-do families were taken from 14 public schools in different parts of India, children belonging to low income group were from Government Schools of Hyderabad city (Andhra Pradesh). Adolescent males between the ages of 12 and 16 years belonging to well-to-do families were taller by 2.0 to 5.5 cm and heavier by 4.0 to 6.5 kg than those belonging to upper socioeconomic group in the present study (Table 76 and 77). Their results also in variance with the observations recorded by the ICMR (1984), according to which the Punjabi subjects between the ages of 12 and 17 years were found to be taller and heavier than those belonging to any other state in India.

It was expected that the present study of Chandigarh zone, which in 1956-65 (the year of study of ICMR) was
included in Punjab would continue to show that the subjects of this zone are taller and heavier than those of other states in India. Observations made by Vijayraghavan et al. (1971) seemed surprising. Subjects aged between 5 and 16 years studied by Vijayraghavan et al. (1971) were even taller (males by 8.0 - 12.0 cm and females by 6.0 - 11.5 cm) and heavier (males by 4.5 - 11.5 kg and females by 4.7 - 10.6 kg) than those recorded by the ICMR (1984) in Andhra Pradesh region. In case of females of well-to-do families, their observations showed that the subjects were shorter but heavier than those reported by the ICMR (1984) and the present worker. Identification of the well-to-do and poor subjects on the basis of type of school studied in, is obviously incorrect. Attendance at a school does not indicate correctly the socioeconomic status of the parents. Even well-to-do person may send his children to government school and vice versa, if a public school does not exist in the neighbourhood.

The adolescent males between the ages of 12 and 16 years belonging to low income group studied by Vijayraghavan et al. (1971) were shorter by 2.0 to 3.0 cm
and lighter by 2.0 to 5.0 kg than those belonging to lower socioeconomic group in the present work (Tables 76 and 77). Statistically, the differences between heights and that between weights were either highly significant ($p < .001$) or significant at 5% level ($p < .05$). However, the adolescent females between the ages of 12 and 16 years belonging to low income group were slightly shorter (1.0 to 2.0 cm) and heavier (0.5 to 1.5 kg) than those belonging to low income group in the present study. Statistically, the differences between heights and that between weights were insignificant ($p > .05$).

II. **Skinfold thicknesses**

On comparing the results of the present study with those given by Sharma and Kaul (1970), it was found that males of lower socioeconomic group between the ages of 12 and 17 years, the skinfold thicknesses of triceps, subscapular and suprailiac were larger by 0.2 - 2.0 mm in the present study (Tables 73, 79 and 81). However, medial calf skinfold thickness was larger by 0.4 - 1.7 mm in the observations taken by Sharma and Kaul (1970) than those in the present study. The present author has used a standard skinfold caliper whereas
Sharma and Kaul (1970) did not even indicate the name of the instrument used by them.

Using a Harpenden skinfold caliper, Berry (1971) measured triceps, infrascapular and suprailiac skinfold thicknesses in a random sample of 1000 men between the ages of 13 and 27 years, who were undergraduate students of the six colleges and two polytechnics of Chandigarh. He did not divide his sample according to socioeconomic groups. It may be noted that Chandigarh zone colleges cater students of both high and low socioeconomic groups.

The median triceps skinfold thickness of 8.2 mm and infrascapular skinfold thickness of 10.3 mm as given by him are almost midway between the skinfold thicknesses found by the present worker in the upper and lower socioeconomic groups belonging to the similar age-group (Tables 73 and 79). It seems that the subjects on whom the skinfold thicknesses were measured by Berry (1971) belonged to middle socioeconomic group. As regards the suprailiac skinfold thickness the present results could not be compared with that of Berry (1971) as he had taken a different landmark than the one taken by the present worker. He had measured the skinfold
thickness an inch above the medial to the anterior superior iliac spine and subject was kept sitting and bent, whereas the present author had taken the measurement at a point where the midaxillary line joined the iliac-crest and the subject was kept standing.

Satwanti et al. (1977) measured five skinfold thicknesses namely biceps, triceps, subscapular, iliac-crest and front of thigh in 65 apparently healthy Punjabi women between the ages of 18 and 30 years, whose families had settled in Delhi. These authors neither mentioned the socioeconomic status of the subjects nor the education received by them. They found the triceps and subscapular skinfold thicknesses to be 15.52 and 14.72 mm respectively, which are midway between those observed by the present worker in subjects of upper and lower socioeconomic status in the same age-group (Tables 78 and 79). However, the mid-thigh skinfold thickness of 26.82 mm as observed by them was larger than that noted by the present author even in the upper socioeconomic group (Table 82). It has not been possible to ascribe reason for this discrepancy. Iliac-crest skinfold thickness as measured by Satwanti et al. (1977) could not be compared with those recorded by the
present author as the former had not described the exact site where the skinfold thickness was measured. They stated that they had followed the technique of taking measurement as given by Sloan (1962), Katch and Michael (1968), Wilmore and Behnke (1970), Katch and McArdle (1973), Durnin and Womersley (1974) and Pollock, Laughridge, Coleman, Linnerud and Jackson (1975). An examination of the papers of these authors shows that all of them did not follow the same procedure while measuring the iliac-crest skinfold thickness; whereas Willmore and Behnke (1970) had taken vertical skinfold on the crest of the ilium in the midaxillary line, Katch and Michael (1968) measured the same in the midaxillary line at a site midway between the lower rib and the "protuberance" of the iliac-crest. Similarly Weiner and Lourie (1969) had taken the site one centimeter above and two centimeters medial to the anterior superior iliac spine. This site had been taken by Sloan (1962), Durnin and Womersley (1974) and Pollock et al. (1975).

Therefore, the claim of Satwanti et al. (1977) that they had followed the same technique as previous workers, does not seem to be correct. The thickness of suprailiac crest skinfold is bound to differ from author
to author as they had been taking different points for measurements. It seems that there is no agreement by various workers regarding the exact site at which the suprailliac thickness could be measured.

In another investigation Satwanti et al. (1980 a) measured body weight, height and skinfold thicknesses of 230 young "Punjabi" women between the ages of 16 and 32 years belonging to middle-class families, who were "more or less physically inactive" and which included both lean and obese subjects. They measured 12 skinfold thicknesses including that of biceps, triceps, midaxillary, subscapular, chest, abdomen I, abdomen II, iliac-crest, front and back of thigh, lateral, medial and posterior calf, knee and chin. Although they claimed that they took measurements in the subjects who belonged to middle-class families, they did not indicate the criteria adopted by them to call a family as "middle-class". Triceps skinfold thickness as recorded by them at 16 years was 14.70 mm, which was midway between that recorded by the present worker in the upper (17.38 mm) and in the lower (11.30 mm) socioeconomic groups (Table 78). However, at 17 years the triceps skinfold thickness given by them was 13.70 mm, which was nearer to the measurement noted by the present
investigator in the lower socioeconomic group (12.50 mm) than in the upper socioeconomic group (17.50 mm). The reason for the difference between their observations and that of the present worker seems to be (1) they did not define the middle socioeconomic group, (2) they included both lean and obese subjects in the same group.

Satwanti et al. (1980) measured body height, weight, 12 skinfold thicknesses and 21 circumferences in 50 adult Punjabi women between the ages of 25 and 32 years, who were "physically inactive". No information was provided by them regarding the socioeconomic status of the subjects. The present worker can compare only those skinfold thicknesses which had been taken by him and which Satwanti et al. (1980) differ from those taken by the present worker, it is not possible to compare the results exactly in similar age-groups. The age-group of present worker namely 18-29 years is nearer to their age-group of 25-32 years. A comparison of the observations in the two age-groups shows that their subscapular (15.93 mm) and medial calf (15.49 mm) skinfold thicknesses were midway between those recorded by the present worker in the upper and lower socioeconomic groups (Table 79 and 83). However, they found mid-thigh...
skinfold thickness to be 31.65 mm which was double than that observed even in the subjects of upper socioeconomic group in the present study (Table 82), but they did not indicate exact site where thigh skinfold thickness was measured. The triceps skinfold thickness as recorded by Satwanti et al. (1980 b) was 17.49 mm which was closer to that observed in the upper (18.42 mm) than to lower (11.38 mm) socioeconomic groups in the present investigations (Table 78).

III Circumferences

Vijayraghvan, Singh and Swaminathan (1974) measured mid-upper arm circumference in 6600 subjects belonging to well-to-do families and 2000 persons of low socioeconomic group of both sexes between the ages of 5 and 18 years. Subjects of well-to-do families were from public schools of different parts of India, whereas those of low socioeconomic group were from the city of Hyderabad in Andhra Pradesh. Mean upper arm circumference of the males and females of well-to-do families between the ages of 12 and 18 years, was larger by 1.0 to 2.0 cm than those found in the upper socioeconomic group at corresponding ages in the
present investigation (Table 84). The difference might be due to different methods used in separating the age-
groups whereas they had taken the ages as 12-13, 13-14 and so on, the present author has taken the age as nearest birthday.

In the males, the mean upper arm circumferences given by Vijayraghvan *et al.* (1974) between the ages of 12 and 18 years of lower socioeconomic group were almost the same as observed in the present report, but in the females, the measurements taken by them were higher by 0.33 to 1.5 cm than recorded in the present investigation (Table 84).

Sathyavati, Agarwal and Agarwal (1981) measured the waist girth, pelvic breadth, hip breadth and hip girth of 915 subjects of both sexes between the ages of 10 and 21 years selected at random from rural and urban areas of Andhra Pradesh. These subjects belonged to "middle and lower middle" socioeconomic groups. They based their socioeconomic groups on the classification given by the Central Statistical Organization (1962). The present worker already had argued that the said classification was not satisfactory as he did not take into consideration the number of mouths to be fed and the education of the
subjects. However, the subjects which Sathyavati et al. (1981) had taken belonged to Class II and III, which could be considered as belonging to middle socioeconomic group, but the present worker had not included in his work the subjects of middle socioeconomic group. Therefore, the results of the present study based on the subjects of upper and lower socioeconomic groups could not be compared with those given by Sathyavati et al. (1981). Their results should fall somewhere in between the present subjects belonging to upper and lower socioeconomic groups. For example, at the age of 17 years the trunk-waist and hip circumferences found by Sathyavati et al. (1981) were smaller by 5.0 cm each than those recorded in upper socioeconomic group and a little larger (waist by 1.5 cm and hip by 2.0 cm) than those noted in the lower socioeconomic group in the present study (Tables 86 and 87).

On comparing the chest circumference recorded by the present worker in adolescents (12-17 years) and adults (18-21 years) of the upper socioeconomic group with those given by the ICMR (1984) in Class I, it was seen that in the present study the chest circumference was larger by 0.4 - 2.17 cm in adolescent males and by 2.0 - 3.0 cm in the adult males than those recorded by the ICMR (1984) (Table 35). Similarly, in the adolescent females of upper
socioeconomic group the chest circumference was larger by 0.85 - 4.14 cm and in adult females by 4.0 - 5.0 cm in the present study than those noted by the ICMR (1984) Table 85.

The chest circumference of adolescents (12-17 years) and adults (18-21 years) of lower socioeconomic group in the present study were compared with those given by the ICMR (1984) in Class VI. In the adolescent males the chest circumference was larger by 0.62 - 2.39 cm and in adult males by 3.0 - 4.0 cm in the present observations than those given by the ICMR (1984). However, the chest circumference of adolescent females was smaller by 0.6 - 1.5 cm in the present work than those recorded by the ICMR (1984), but in the adults it was almost the same in the present study as well as those given by the ICMR (1984) Table 85.

2. Studies done outside India

The present observations in the upper socioeconomic group were compared with the studies conducted outside India.

I. Height and weight (Tables 90 to 92, Graphs 26 to 29)

The males between the ages of 12 and 17 years in the present study were taller by 1.4 - 8.2 cm and heavier by 1.0 - 6.0 kg than the Nigerians (Johnson, 1972) at the corresponding ages. However, the Egyptian
males (McDowell, Taskar and Sarham, 1970) between the ages of 12 to 17 years were shorter by 0.6 - 6.0 cm but were heavier by 1.0 - 3.5 kg than those in the present study at corresponding ages; similarly, the Japanese (Tokyo, 1963 and 1970) were shorter by 0.6 - 3.2 cm but were heavier by 2.4 - 4.7 kg than those found in the present study. The Indian males in the present study between the ages of 12 and 17 years were shorter by 1.6 - 6.3 cm and lighter in weight by 3.5 - 8.0 kg than the Britishers (Tanner et al., 1966) by 1.6 - 6.1 cm and by 5.0 - 9.5 kg than the East Germans (Oehmisch, 1970), by 3.6 - 7.1 cm and by 8.0 - 11.0 kg than the American Whites (Hamill, Johnston and Cramps, 1970 and Hamill, Johnston and Lemeshow, 1973 a) and by 3.6 - 7.3 cm and 4.0 - 9.0 kg than the American Blacks (Hamill et al., 1970 and Hamill, Johnston and Lemeshow, 1973 b).

The females between the ages of 12 and 17 years in the present study were taller by 1.8 - 8.4 cm but were lighter in weight by 1.6 - 7.0 kg than the Egyptians (McDowell et al., 1970) by 4.0 - 7.0 cm and by 1.0 - 3.3 kg than the Japanese (Tokyo, 1963 and 1970) and by 2.3 - 10.0 cm and by 0.02 - 1.0 kg than the Nigerians (Johnson, 1972). However, Indian females
between the ages of 12 and 17 years were shorter by 0.4 - 3.6 cm and lighter in weight by 2.0 - 8.0 kg than the East Germans (Oehmisch, 1970), by 0.5 - 3.2 cm and by 1.0 - 8.0 kg than the Britishers (Tanner et al., 1966), by 1.4 - 3.4 cm and by 5.4 - 9.4 kg than the American Whites (Hamill et al., 1970 and Hamill et al., 1973 a) and by 0.7 - 4.0 cm and by 6.6 - 11.0 kg than the American Blacks (Hamill et al., 1970 and Hamill et al., 1973 b).

In adult subjects different workers have taken different age-groups for measuring the height and weight, therefore, present observations cannot be compared exactly with those taken in other countries.

The Nigerian males (Johnson, 1970) in the age-group of 30-39 years were smaller by 0.98 cm and lighter by 7.51 kg than the Indian subjects in the corresponding age-group in the present study. The Japanese males (Nagamine and Suzuki, 1964) in the age-group of 18-29 years were shorter by 3.48 cm and lighter in weight by 3.72 kg than those found in same age-group in the present study. However, the Egyptian males (Weirtinski, 1970) in the age-group of 19-63 years were smaller by
MEAN BODY WEIGHT IN Kg.

AMERICAN WHITES
- - - - -
AMERICAN BLACKS

PRESENT STUDY

JAPANESE

EGYPTIANS

BRITISHERS

EAST GERMANS

GRAPH - 28
AGE IN YEARS

0 10 20 30
MEAN BODY WEIGHT IN KG.

MALES

1 2 3 4 5 6 7 8
1.0 cm and lighter by 2.1 kg than the Indian subjects in the age-group of 18-49 years in the present study. The Britisher males (Khosla and Lowe, 1968) in the age-group of 20-29 years were taller by 3.5 cm and heavier by 12.78 kg than those measured in the present study in the age-group of 18-29 years (Table 92).

The Nigerian females (Johnson, 1970) in the age-group of 30-39 years were smaller by 0.8 cm and lighter in weight by 0.47 kg than those in the Indian subjects in the similar age-group in the present study (Table 92).

II. Skinfold thicknesses (Graphs 30 to 37)

In the Tanzanian males (Haustvast, 1971) between the ages of 12 and 17 years the skinfold thickness of triceps was smaller by 1.3 - 2.0 mm and subscapular by 1.4 - 2.3 mm than those noted in the present study at corresponding ages (Tables 93 and 94). However, in the Japanese males (Kondo and Eto, 1972) between the ages of 12 and 17 years, the triceps skinfold thickness was larger by 0.5 - 2.2 mm and subscapular by 0.8 - 1.6 mm than those recorded in the present study at similar ages (Tables 93 and 94). The East German males (Grimm, 1966)
between the ages of 12 and 17 years had the triceps skinfold thickness larger by 1.9 - 4.2 mm than that found in the present study (Table 93). The British males (Tanner et al., 1975 a) between the ages of 12 and 15 years had the triceps skinfold thickness larger by 0.4 - 0.9 mm, whereas it was a little smaller (by 0.5 - 0.6 mm) at 16 and 17 years than those recorded in the present study (Table 93). The subscapular skinfold thickness in the British males (Tanner et al., 1975 a) between the ages of 12 and 17 years was smaller by 0.4 - 0.9 mm than that found in the present study at similar ages (Table 94). The difference in measurements of the British subjects as compared to Indians of Chandigarh zone was so small that it could be ignored. It may, therefore, be stated that skinfolds of present population of Chandigarh zone were comparable in thicknesses with those of the British people. The American White males (Johnston et al., 1972, 1974 a and b) between the ages of 12 and 17 years had skinfold thicknesses of triceps to be larger by 0.2 - 2.9 mm, subscapular by 0.1 - 0.9 mm, iliac-crest by 0.2 - 3.4 mm and medial calf by 0.3 - 1.9 mm than those measured in the present study (Tables 93 to 96). While in the
American Black males (Johnston et al. 1972, 1974 a and b) between the ages of 12 and 17 years, triceps skinfold thickness was smaller by 0.2 - 1.3 mm, subscapular by 0.2 - 0.8 mm, iliac-crest by 0.3 - 3.9 mm and medial calf by 2.0 - 3.9 mm than those found in the present study (Tables 93 to 96).

Indian females between the ages of 12 and 17 years, in the present study, had triceps skinfold thickness to be larger by 3.7 - 5.3 mm and subscapular by 0.8 - 4.6 mm than those of the Tanzanians (Hautvast, 1971), by 0.2 - 4.4 mm and by 0.7 - 2.0 mm than the Japanese (Kondo and Eto, 1972) and by 0.3 - 2.3 mm and by 2.0 - 3.1 mm than the Britishers (Tanner et al. 1975 a). While in the East German females (Grimm, 1966) between the ages of 12 and 17 years, triceps skinfold thickness was larger by 1.2 - 5.9 mm than that found in the present study (Table 93).

The American White females (Johnston et al. 1972, 1974 a and b) between the ages of 12 and 14 years had triceps skinfold thickness to be larger by 0.8 - 1.4 mm, and iliac-crest by 0.1 - 1.1 mm, the same skinfold thickness at the ages of 15 to 17 years were smaller by 0.4 - 1.3 mm and by 1.1 - 3.2 mm respectively than those observed in the present investigations (Tables 93 and 95).
However, the subscapular skinfold thickness was smaller by 0.5 - 2.2 mm in the American White females (Johnston et al. 1972, 1974 a and b) between the ages of 12 and 17 years than those found in the present study (Table 93). The medial calf skinfold thickness was larger by 0.9 - 2.4 mm in American White females (Johnston et al. 1972, 1974 a and b) between the ages of 12 and 17 years than those observed in the present study (Table 96). Various skinfold thicknesses of the American Black females (Johnston et al. 1972, 1974 a and b) between the ages of 12 and 17 years were smaller than those recorded in the present investigations, triceps by 0.4 - 3.2 mm, subscapular by 0.6 - 2.2 mm, iliac-crest by 0.6 - 4.7 mm and medial calf by 0.7 - 4.2 mm (Tables 93 to 96).

In adult subjects, the present worker could not compare the skinfold thicknesses with those recorded in other countries as the age-groups did not match.

The Japanese males (Nagamine and Suzuki, 1964) in the age-group of 18-29 years had triceps skinfold thickness to be larger by 3.07 mm and subscapular by 4.36 mm (Table 92) than those noted in the present study in the corresponding age-group. However, the Egyptian males (Wiercinoki, 1970) in the age-group of 19-68 years...
MEAN TRICEPS SKINFOLD THICKNESS IN mm

AGE IN YEARS

GRAPH-30

12 13 14 15 16 17

MALES

AMERICAN WHITES

JAPANESES

TANZANIANS

PRESENT STUDY

AMERICAN BLACKS

EAST GERMANS

BRITISHERS
MEAN SUBSCAPULAR SKINFOLD THICKNESS IN mm

AGE IN YEARS

GRAPH-32
MEAN SUBSCAPULAR SKINFOLD THICKNESS IN mm.

GRAPH-33

AGE IN YEARS

FEMALES

PRESENT STUDY
TANZAINS
JAPANESE
BRITISHERS
AMERICAN BLACKS
AMERICAN WHITES

MEAN SUBSCAPULAR SKINFOLD THICKNESS IN mm.

12 13 14 15 16 17
Mean iliac-crest skinfold thickness in mm.

<table>
<thead>
<tr>
<th>Females</th>
<th>American Whites</th>
<th>American Blacks</th>
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<tr>
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Age in years

Graph-35
MEAN MEDIAL CALF SKINFOLD THICKNESS IN mm.

GRAPH-36

MALES
AMERICAN WHITES
AMERICAN BLACKS
PRESENT STUDY

AGE IN YEARS

12 13 14 15 16 17

PRESENT STUDY
AMERICAN WHITES
AMERICAN BLACKS
MEAN MEDIAL CALF SKINFOLD THICKNESS IN mm.

AGE IN YEARS

FEMALES

AMERICAN WHITES

AMERICAN BLACKS

PRESENT STUDY

AMERICAN BLACKS

PRESENT STUDY

GRAPH-37
had triceps skinfold thickness to be larger by 3.0 mm and subscapular by 6.0 mm than those recorded in the present investigations in the age-group of 18-49 years (Table 92).

III. Circumferences (Graphs 38 to 43)

The upper arm circumference of the Tanzanian males (Haustvast, 1971) between the ages of 12 and 17 years was larger by 0.2 - 1.6 cm than that noted in the present study at similar ages (Table 97); the calf circumference in the former was smaller by 0.6 - 1.0 cm between the ages of 12 and 14 years, but became larger by 0.3 - 1.1 cm at 15 to 17 years than that recorded in the present investigations at corresponding ages (Table 99). The upper arm circumference of the Hong Kong Chinese males (Chang, 1969) between the ages of 12 and 17 years was smaller by 0.1 - 0.8 cm, but calf circumference was larger by 1.5 - 2.5 cm than those measured in the present observations (Tables 97 and 99). The chest circumference of the Ghanian males (Agbenu, 1969) between the ages of 12 and 17 years was smaller by 0.7 - 3.4 cm than those recorded in the present investigation (Table 98). The chest circumference of the Japanese males (Tokyo, 1963) between the ages of 12 and 17 years was larger by 1.9 -
4.4 cm and of East German males (Oehmisch, 1970) by 4.9 - 9.5 cm than those measured in the present observations at corresponding ages (Table 98). The upper arm circumference of the British males (Eveleth and Tanner, 1976) between the ages of 12 and 17 years was larger by 1.9 - 2.4 cm and calf circumference by 2.8 - 3.3 cm than those in the present study (Tables 97 and 99). Similarly, the upper arm circumference of American White males (McCammon, 1970) between the ages of 12 and 17 years was larger by 2.2 - 2.9 cm, chest by 3.3 - 5.1 cm and calf by 2.8 - 3.5 cm than those recorded in the present investigation (Tables 97 to 99). The chest circumference of the American Black males (Verghese, Scott, Teixeira and Ferguson, 1969) between the ages of 12 and 17 years was larger by 4.5 - 6.4 cm than those recorded in the present study (Table 98).

The upper arm circumference of the Tanzanian females (Hautvast, 1971) between the ages of 12 and 17 years was larger by 0.6 - 2.5 cm than those noted in the present study (Table 97); the calf circumference of the former was smaller by 0.3 - 1.3 cm between the ages of 12 to 14 years, but became larger by 2.3 - 2.5 cm between the ages of 15 to 17 years than those recorded in the present investigations at the corresponding ages.
(Table 99). The upper arm circumference of the Hong Kong Chinese females (Chang, 1969) between the ages of 12 and 17 years was smaller by 0.1 - 1.5 cm, but calf circumference was larger by 0.6 - 2.6 cm than those measured in the present observations (Tables 97 and 99). The chest circumference of the Ghanian females (Agbenu, 1969) between the ages of 12 and 17 years was smaller by 0.6 - 5.1 cm than those noted in the present investigation at corresponding ages (Table 98).

The chest circumference of the Japanese females (Tokyo, 1963) between the ages of 12 and 17 years was larger by 0.3 - 4.8 cm and of the East German females (Oetimisch, 1970) was larger by 3.4 - 9.9 cm than those measured in the present observations at similar ages (Table 98). The upper arm circumference of the British females (Eveleth and Tanner, 1976) between the ages of 12 and 17 years was larger by 1.6 - 3.2 cm and calf by 1.8 - 4.0 cm than those noted in the present study (Tables 97 and 99). The upper arm circumference of the American White females (McCammon, 1970) between the ages of 12 and 17 years was larger by 1.1 - 1.8 cm and calf circumference by 1.3 - 3.4 cm, but the chest circumference was smaller by 4.3 -
6.7 cm than those measured in the present investigations (Tables 97 to 99). The chest circumference of the American Black females (Verghese et al., 1969) between the ages of 12 and 17 years was smaller by 4.3 - 6.7 cm than those recorded in the present study at corresponding ages (Table 98).

In adult subjects the present worker could not compare the circumferences with those recorded in the other countries as the age-groups did not match.

The upper arm circumference of the Japanese males (Nagamine and Suzuki, 1964) in the age-group of 18-29 years was larger by 0.45 cm and the calf circumference by 1.36 cm (Table 92) than those noted in the present study in the corresponding age-group. However, the upper arm circumference of the Egyptian males (Weircinski, 1970) in the age-group of 19-68 years was smaller by 0.1 cm than those recorded in the present investigation in the age-group of 18-49 years (Table 92).
MEAN UPPER ARM CIRCUMFERENCE
IN cm.

AGE IN YEARS

18 20 22 24 26 28 30

12 13 14 15 16 17

MALES

AMERICAN WHITES
BRITISHES
HONG KONG CHINESE
TANZANIANS
PRESENT STUDY

GRAPH-38
MEAN UPPER ARM CIRCUMFERENCE
IN cm.

AGE IN YEARS

12 13 14 15 16 17

FEMALES

AMERICAN WHITES

BRITISHERS

HONG KONG CHINESE

PRESENT STUDY

TANZANIANS

GRAPH-39