ANNEXURE-IV

ANTHROPOMETRIC MEASUREMENTS

In all, sixteen anthropometric measurements were taken on each subject, with minimum possible clothing, following the techniques given by Weiner and Lourie (1969). The anthropometric measurements considered in this study are described below:

1. **Height**: It is the vertical distance between the point vertex and the floor.

   **Instrument**: Anthropometer

   **Technique**: The subject was made to stand on a horizontal platform with his heels together, stretching upwards to the fullest extent, aided by gentle traction by the investigator on the mastoid process. The subject's back was kept as straight as possible which was achieved by relaxing the shoulders and manipulating the posture. Care was taken that the marked Frankfurt plane was horizontal. The horizontal arm of an anthropometer was brought down on the subject's head and the measurement was recorded in cm. The subject's heels were watched to make sure they do not leave the ground.

2. **Sitting height**: It measures the maximum distance from the vertex to the sitting plane.

   **Instrument**: Anthropometer

   **Technique**: Subject was made to sit on the table top with his/her back stretched upright and feet hanging down freely over the edge of the table. Gentle traction was applied under the chin. Care was taken that the muscles of the thighs and buttocks were uncontracted. The head was held in the Frankfurt plane and the
anthropometer was held vertically, in contact with the back at the sacral and interscapular regions. The horizontal arm of the anthropometer was brought down to touch the point vertex on the subject’s head and the measurement was recorded in cm.

3. **Chest Breadth**: It measures the transverse diameter at the level of nipples in case of boys and xiphion in case of girls.

   **Instrument**: Anthropometric rod compass.

   **Technique**: Subject was made to stand erect with arms away from body. Rod compass was spread horizontally at the level of nipples in boys and xiphion in girls. Now, reading was recorded in cm, when the subject was breathing properly.

4. **Chest Depth**: It measures the diameter of the chest in anterior – posterior direction.

   **Instrument**: Anthropometric rod compass.

   **Technique**: Subject was made to stand erect with arms away from body. Rod compass was spread in anterior–posterior direction of the chest at the level of nipples in boys and xiphion in girls and the reading was recorded in cm.

5. **Head circumference**: It is the circumference of the head from glabella to glabella passing through opisthocranion.

   **Instrument**: Steel tape.

   **Technique**: The subject was asked to sit on a stool. Firstly the landmark glabella was marked. The zero end of steel tape was kept on glabella. The tape was unrolled with right hand and successively driven by left hand through opisthocranion and brought back to glabella and the reading was recorded in cm.

6. **Chest Circumference**: It measures the circumference of the chest
at the level of nipples in case of boys and at level of xiphion in case of girls.

**Instrument:** Steel tape.

**Technique:** It was measured at right angle to the axis of the body. The zero end of the tape was held in middle of the chest in left hand and the tape was unrolled along with the right hand. The two ends of the tape were joined and held with left hand and with right hand it was checked whether the tape was in the correct position behind the shoulder. During the process, arms of the subject were raised slightly and the circumference was recorded during normal breathing. The reading was recorded in cm.

7. **Calf circumference:** It is the maximum circumference of the calf in the plane at right angle to the leg axis.

**Instrument:** Steel tape.

**Technique:** The subject was asked to stand erect with both feet apart and body weight distributed equally on both feet. The steel tape was wrapped around the leg at right angle to its long axis and the maximum value was recorded in cm.

8. **Upper-arm circumference:** It is the maximum circumference of the upper-arm in the plane at right angle or horizontal to the humerus.

**Instrument:** Steel tape.

**Technique:**

(a) **Normal:** The subject was made to stand erect with his arms hanging straight by the sides and the measurement was taken at right angle to the axis of the hanging arm, approximately midway between the lower edge of lateral border of acromion process and the tip of the olecranon process. The reading was recorded in cm.
(b) Flexed: It was taken with arm relaxed and elbow extended. The subject was asked to bend the arm to the maximum and the measurement was recorded.

9. Humerus Biepicondylar diameter: It is the straight distance between the lateral most and the medial most point on the lateral and medial condyle of the humerus, respectively.

**Instrument:** Sliding caliper.

**Technique:** The subject's elbow was bent at right angle and the width across the outer most part of the lower end of the humerus was taken. This measurement is usually oblique since the inner condyle of the humerus is lower than the outer one. Slight pressure was exerted to compress the tissue. The reading was recorded in cm.

10. Femur Biepicondylar diameter: It is the straight distance between the lateral most and the medial most point on the lateral and medial condyle of femur, respectively.

**Instrument:** Sliding caliper

**Technique:** The subject was asked to sit on the table with his/her knee bent at right angle. The width across the outermost parts of the lower end of the femur was measured i.e. the maximum breadth between the lateral most and medial most point was taken. Slight pressure was exerted to compress the tissue and the reading was recorded in cm.

**Skinfold Measurements**

The skinfold thickness (mm) was measured at various sites by pinching up the skin and subcutaneous tissue between thumb and the forefingers at specified points of the body. The skin was lifted by firmly...
grasping the fold and pulling it away from the underlying muscle. Caliper jaws were applied exactly at the marked level. The measurement was read two seconds after the full pressure of caliper jaws were applied to the skinfold. Care should be taken to avoid compressing of skin for a longer period to prevent the jaw creep, which may result in inaccurate readings. All skinfolds were taken in millimeters.

**Instrument:** Harpenden skinfold caliper.

11. **Triceps skinfold:** The skinfold was picked up at the back of the arm, over the triceps muscle, about 1 cm above the level marked on the skin for upper-arm circumference and directly in line with the point of the elbow or olecranon process.

12. **Biceps skinfold:** The skinfold was picked up on the front of the upper arm, over the biceps muscle, at a level which is mid way between the acromion and radial landmarks. It is at the same level as the biceps skinfold.

13. **Subscapular skinfold:** The skinfold was picked up immediately below and just lateral to the inferior angle of the left scapula, pointing slightly downwards and outwards.

14. **Supraspinale skinfold:** The skinfold was picked up approximately 1 cm above and 2 cm medial to the anterior superior iliac spine.

15. **Calf skinfold:** This skinfold was picked up at the level of maximum circumference of the calf on the medial border of the leg.

16. **Weight:** The weight of the subject was measured in kilograms with minimum possible clothing.

**Instrument:** Weighing machine

**Technique:** Weight in kg was taken on the machine with the subject wearing minimum clothing and without shoes. The subject was asked to stand still in the center of the platform of the machine.
with equal pressure on both the feet. The pointer was adjusted at zero before taking the weight of the subject and the reading was noted only if the zero of the scale returned exactly below the pointer after the subject came down from the platform, the calibration of the scale was checked regularly with the help of standard weights (10 to 50 kg).