ABSTRACT

The present study was conducted to estimate the trends of handgrip strength in children, adolescents and adults of Amritsar covering a wide age range from 6-25 years, to study the gender differences on the basis of handgrip strength in various age groups, to search any association of handgrip strength with selected anthropometric characteristics of the population studied and to estimate the handgrip strength of volleyball and softball players aged 18-25 years.

A total of 2167 normal healthy individuals from both sexes, aged 6-25 years were selected purposively from Amritsar, Punjab. To estimate the handgrip strength of pre-adolescents of 6-10 years and adolescents of age group 11-15 years, a total of 1111 samples (545 pre-adolescents and 566 adolescents) were selected from different schools of Amritsar. Post-adolescents of age group 16-20 years (n = 548) were also selected from different schools and colleges of Amritsar. Young adults (n = 508) aged 21-25 years were selected from different colleges and university of Amritsar, Punjab. A total of 114 volleyball players and 113 softball players aged 18-25 years were also considered as samples. These samples were taken from state and inter-university level competitions organized in Amritsar, Punjab, India. An equal number of controls were also taken. Study was conducted during 2009 to 2012. Age of the subjects was estimated from the registers of their respective institutes. The study was approved by the Institutional ethical committee. The subjects were informed about the purpose of the trial and their signed informed consent forms were collected.

Apart from dominant and non-dominant handgrip strength, as many as twenty six anthropometric characteristics namely, height, weight, BMI, hand length, hand breadth, second digit length, fourth digit length, 2D/4D ratio, upper arm circumference, hip circumference, biceps, triceps, subscapular, suprailiac and calf skinfolds, humerus and femur biacromial diameters, upper arm length, forearm length, total arm length, arm muscle area, arm area, arm fat area, arm fat index, percent body fat and percent lean body mass were also measured. All the anthropometric measurements were taken on each subject following standard techniques.

In the present study, male and female students showed a continuous increase in handgrip strength with age. The increase in dominant and non-dominant handgrip strength with age was approximately parallel for boys and girls until 13 years of age, after
which male students were significantly stronger than female students. Statistically significant differences (p<0.05-0.001) for dominant handgrip strength were found in 8, 9 and 14-25 years and for non-dominant handgrip strength in 9, 10 and 14-25 years between male and female students. Both dominant and non-dominant handgrip strength were found to have statistically significant (p<0.05-0.01) positive correlations with height, weight, BMI, hand length, hand breadth, 2nd digit length, 4th digit length, upper arm and hip circumferences, humerus and femur biepicondylar diameters, upper arm, forearm and total arm lengths, arm muscle area and arm area in all the age groups, with arm fat area, percent lean body mass and all five skinfolds (in certain age groups). However, significant negative correlations (p<0.05-0.01) were observed with triceps and calf skinfolds, percent body fat (in 16-20 and 21-25 years), arm fat index (in all age groups except 6-10 years). Non-dominant handgrip strength showed significant negative correlations with subscapular skinfold in the age group of 16-20 years and 2D/4D ratio in 21-25 years.

Anthropometric characteristics such as height, hand length, hand breadth, 2nd and 4th digit length, forearm length, total arm length, arm fat index, humerus biepicondylar diameter showed significant differences (p<0.05-0.001) from 14-25 years between male and female students. However, in upper arm length, significant differences (p<0.05-0.001) were found in the age of 11 and 16-23 years between male and female students. Statistically significant differences (p<0.05-0.001) were found for BMI in 6, 17-23 years, for body weight from 16-25 years, for arm area and upper arm circumference in the age of 17-23 years and for hip circumference, arm muscle area and arm fat area at irregular intervals between male and female students. Statistically significant differences (p<0.05-0.001) were observed at irregular intervals for all skinfold measurements (biceps, triceps, subscapular, suprailiac and calf skinfolds) between male and female students. Percent body fat and percent lean body mass showed significant differences (p<0.05-0.001) from 6-25 years between male and female students. Statistically significant differences (p<0.05-0.001) were found between male and female volleyball and softball players in all the parameters studied except 2D/4D ratio, subscapular skinfold, arm fat area, BMI (only in volleyball players) and biceps skinfold (only in softball players).