SUMMARY

Bronchial asthma is a disease that is becoming a major health issue in India. The situation is complicated by poor access to medical services, high price of effective drugs, and poor health education among the affected population. Changes in dietary habits with more consumption of fast foods, decrease in exercise rates, more dust mites, and more pollution may be responsible for increase in asthma in susceptible individuals.

The present study has been conducted to assess the anthropometric profile and pulmonary functions of bronchial asthma patients and is based on cross sectional data collected on 403 bronchial asthma patients (216 males, 187 females) and 347 normal healthy subjects (158 males, 189 females), ranging in age from 20-70+ years.

The data on asthma subjects have been collected from Civil Hospital, Hoshiarpur and Aggarwal Nursing Home & Chest Clinic, Hoshiarpur. For control sample apparently normal and healthy individuals free from any systemic disease were considered from Hoshiarpur district only. Information was collected from the patients regarding their socio demographic profile, and a detailed clinical history regarding duration and severity of disease was also taken. A severity score was assigned to all the patients on the basis of certain characteristics like frequency of symptoms, presence of nocturnal symptoms, activity limitation, and hospital admission in the previous year and history of life threatening exacerbations. Information regarding current smoking status was also recorded.
Anthropometric profile of asthma patients was studied by recording 13 anthropometric measurements i.e. weight, linear measurements (stature, sitting height, subischial length), chest width, circumferences (upperarm, chest in males only, waist and hip) and skinfolds (biceps, triceps, subscapular, suprailiac). Standard techniques as given by Tanner et al. (1969) have been followed. Body mass index and waist to hip ratio have been derived from these measurements. Body composition i.e. body fat and lean body mass have been calculated by applying equations given by Durnin and Womersley (1974).

Pulmonary functions have been assessed using portable electronic Helios-401 spirometer (Recorders and Medicare Systems, Chandigarh). Eight pulmonary function parameters viz. forced vital capacity, forced expiratory volume in one second, ratio of forced expiratory volume in one second to forced vital capacity, forced expiratory flow 25-75%, peak expiratory flow rate, forced expiratory volume in three seconds, ratio of forced expiratory volume in three seconds to forced vital capacity and lung age have been recorded on each subject.

The data collected have been arranged in 6 age groups, each of ten years duration starting from 20-29 years to 70+ years. The data thus collected have been subjected to various statistical tests viz. mean, standard deviation, standard error of mean, coefficient of correlation, test of significance (‘t’ test) and F-test. The results obtained have been presented in tabular form and illustrated through distance curves and bar diagrams.
Results:

I. Anthropometric Profile

Weight is one of the most important physical characteristics at all ages which reflects the health status of an individual. In male patients an overall trend of decrease in weight from age group 20-29 years to 70+ years has been observed with slight fluctuations whereas in patient females, it has shown a trend of increase up to 40-49 years followed by decrease up to 70+ years. Controls have also shown initial trend of increase in weight up to 5th and 6th decades in males and females respectively followed by decrease up to 70+ years. Patients have been found to be lighter in weight than controls in all age groups with statistically significant differences at the age groups of 40-49, 60-69 and 70+ years in males and 40-49, 50-59 and 60-69 years in females.

The linear measurements i.e. stature, sitting height and subischial length have shown a trend of decrease with advancing age in both patients and controls. The patients have lower values for stature, sitting height and subischial length but the differences are not statistically significant.

The circumferences have shown a trend of increase up to fifth or sixth decade followed by decrease in both patients and controls. The values for upperarm, chest (males), waist and hip circumferences have been found to be lower in patients as compared to controls in most of the age groups but the differences are not statistically significant except upperarm circumference in which the differences have reached a level
of significance at the age groups 30-39, 40-49, 60-69 and 70+ years in males and at age group 30-39 and 50-59 years in females.

The mean values of chest width in patients have been found to be lower than controls in all the age groups with statistically significant differences at age groups of 40-49 years in males and 50-59, 60-69 years in females.

All the skinfolds i.e. biceps, triceps, subscapular and suprailiac have shown a trend of increase up to middle years followed by decrease up to 70+ years with intermittent fluctuations. Patients have lower values of skinfolds with significant differences in some age groups.

A trend of increase in body fat up to fifth or sixth decade has been observed in patients and controls whereas lean body mass has shown a trend of decrease with advancing age. The patients have lesser amount of body fat and lean body mass as compared to control subjects with significant differences at the age groups 60-69 and 70+years for fat and 40-49 and 60-69 years for lean body mass in males and in most of the age groups in females.

II. Pulmonary functions

All the pulmonary function parameters i.e. forced vital capacity, forced expiratory volume in one second, ratio of forced expiratory volume in one second to forced vital capacity, forced expiratory flow 25-75%, peak expiratory flow rate, forced expiratory volume in three seconds and ratio of forced expiratory volume in three seconds to forced
vital capacity have shown a trend of decline in both patients and controls from 20-70+ years. In asthma patients, the amount of air in the lungs is not readily exhaled because of physical obstruction so FVC is reduced as compared to normal healthy individuals. FEV1 is a pulmonary function value that is highly diagnostic of asthma. Low FEV1 and FEV1/FVC are characteristic of asthma patients. In the present study also patients have been found to have lower values of all the pulmonary function variables except lung age with statistically significant differences in most of the age groups. The lung age is significantly more in patients indicating poor pulmonary function status.

III. Body mass index (BMI) and pulmonary functions

In patients, body mass index has shown a trend of increase up to 30-39 years in males and 40-49 years in females and in controls, body mass index has shown a trend of increase up to 40-49 years of age in males and up to 50-59 years in females. The patients differed significantly from controls in terms of their BMI with statistically significant differences in the age groups of 40-49, 60-69 and 70+ years in males and 40-49, 50-59 and 60-69 years in females. The mean BMI among patient and control males has been found to be 21.39 kg/m² and 23.85 kg/m² respectively and in patient and control females the mean BMI has been found to be 23.44 kg/m² and 26.61 kg/m² respectively. As per WHO (1995) classification, patients and controls have been classified in different groups as per their BMI. As the patients have been found to be lighter in weight therefore 31.48% male patients and 26.74% female patients have low BMI (<18.5).
The pulmonary functions have shown an improvement with increase in BMI in both male and female patients even in the obese category but in controls the pulmonary functions have decreased in the BMI category of $\geq 30$ (obese).

IV. Waist circumference and pulmonary functions

The pulmonary functions have been analyzed according to waist circumference as per WHO (2000) guidelines. Patient males with waist circumference $> 90$ cm exhibit better pulmonary functions as compared to male patients with waist circumference $\leq 90$ cm and the differences have been found to be statistically significant except for FEF 25-75% and lung age. In patient females also, pulmonary functions improved with increase in waist circumference ($> 80$cm) but the differences in the mean values were statistically significant only for PEFR and FEV3/FVC. In controls pulmonary functions have been found to be better in the subjects with waist circumference $\leq 90$ cm in males and $\leq 80$ cm in females.

V. Waist- to- hip ratio and pulmonary functions

The waist to hip ratio has shown a trend of increase up to age group 50-59 years followed by decrease in both patients and controls and the differences have not been found to be statistically significant except at the age group 60-69 years in males.

The mean values of waist to hip ratio in patient and control males have been found to be 0.90 and 0.91 respectively and the difference is not statistically significant. In patient and control females, the mean values of waist to hip ratio are 0.87 and 0.85 respectively with statistically significant difference.
WHO (2000) guidelines have been used to analyze pulmonary functions according to waist to hip ratio and it has been observed that in patient males, pulmonary functions except FEF25-75% improved with higher waist to hip ratio i.e. >0.9 but the differences in the mean values have not been found to be statistically significant whereas patient females with waist to hip ratio less than ≤0.8 exhibited higher values of all pulmonary functions parameters except PEFR and lung age with differences reaching level of statistical significance for FEV1/ FVC and FEV3/ FVC. In control subjects, males with waist to hip ratio ≤ 0.9 and females with waist to hip ratio ≤ 0.8 have higher values of pulmonary function parameters and the differences have reached level of statistical significance for FEV1, FEV3 and lung age in males and FVC, FEV1, FEV3 and lung age in females.

VI. Pulmonary functions according to smoking status

As per the smoking status of asthma patients, values of all pulmonary functions are significantly lower in asthmatic smokers as compared to asthmatic nonsmokers whereas in controls although the values are lower in smokers but the differences are not statistically significant. It clearly highlights the deleterious effect of smoking on the pulmonary functions of asthmatic patients.

VII. Pulmonary functions according to duration of disease

With increase in duration of the disease, pulmonary function parameters have shown a trend of decline except that in male patients after 10 or more years of disease duration, most of the pulmonary function variables have shown an improvement.
VIII. Pulmonary functions according to severity of disease

As per severity score of asthma, all the pulmonary function parameters have decreased significantly with increase in severity in both male and female patients. The lung age also has shown significant increase with increase in severity of disease thereby reflecting deleterious effect of severity of disease on lung function.

On the basis of findings, the present study can be summarized that asthma patients have been found to be significantly lighter in weight, with lesser values of circumferences and skinfolds. The body fat and lean body mass have also been found to be lesser in patients. All the pulmonary function variables have significantly lower values in patients. In patients, pulmonary functions have been found to improve with increase in BMI even in the category of obese. Increase in waist circumference has also shown positive effect on pulmonary functions in patients. Male patients have also been benefitted from higher waist to hip ratio as shown by improved pulmonary functions. It has also been observed that smoking aggravates the decline in pulmonary functions in asthma patients. With increase in duration and severity of the disease the pulmonary functions have shown decline although in males with increase in duration of more than 10 years some improvement in pulmonary functions has been observed.

Anthropometric assessment of asthma patients is of paramount importance and should be included in the routine assessment of asthmatic patients to assess the impact of the disease on the overall health status, which in turn has a profound effect on the pulmonary functions of the bronchial asthma patients.