CHAPTER – I
INTRODUCTION

Exercises in the form of sports, aerobics or workouts, if performed regularly have a beneficial effect on the various systems of the body. These systems are benefited by such exercises as the flow of blood is increased to the various organs thereby delivering more nutrients, thus improving their functioning. Special attention is being given to the vital organs of the body like the heart, brain and lungs to know the effect of exercise on these organs. The effect of these organs when they are put to endurance tests has been a subject of discussion in the past. Irrefutable evidence now exists to show that regular physical activity slows the rate of decline of most of the physiological parameters that we associate with health and fitness-viz muscle strength, aerobic capacity, reaction time and joint flexibility Heir T et al. (1995).

Pulmonary function is governed by genetic, environmental and nutritional factors and confirms that physical training during growth help in developing a greater endurance in respiratory muscles. Due to regular exercises, athletes tend to have an increase in pulmonary capacity when compared to non-exercising individuals. Intensity and severity of sports engaged in by the athletes probably determines the extent of strengthening of the inspiratory muscles with a resultant increase in the pulmonary functions. Lung size may increase by a strenuous and prolonged strength training regimen during adolescence Doherty M (1997). Significant difference in pulmonary functions is found among types of athletic training. Swimmers have better pulmonary functions because in swimming the load of water pressure against the chest wall and elevated airway resistance as the result of immersion causes increase in the exercise of respiratory muscles Lakhera SC et al. (1994).
American athletes have superior lung volumes compared to Indian athletes, because of athletic training from the childhood in American athletes. Vital capacity of Indians is lower than that of Caucasians, but the age related decline is much greater for caucasians. Besides sedentary lifestyles, respiratory performance is affected by various factors like air pollution. Ethnic variations as well as the variation in age, body size and level of physical fitness influence the pulmonary function tests. Pulmonary function shows variation owing to differences in growth and because of the possibility that those subjects would not have reached their adult weight for body mass index (BMI) Gupta N (2007).

Pulmonary function values in health are also influenced by some unknown variables and there are wide ranges of normalcy. Training improves physical working capacity. A trained sportsman has a resting bradycardia and a greater maximum O2 consumption ability (VO2max) but small percentages of athletes develop exercise induced bronchospasm and thereby reduced PFTs Guyton CA (2006).

Valizadeh L et al. (2012) compared the pulmonary function parameters changes at different altitudes in eleven voluntary Female athletes, (age; 22.27±0.65yr), (weight; 57.00±6.31kg), (Fat%:20.81 ±3.2 1) (Height; 160.54± 3.7cm and vo2max: 40.65±1.00) with spirometric parameters. Respiratory function was assessed in participants before ascending at baseline (1400 meter) and after ascending at 3600 meter in Savalan Mount and sea level (3 day's interval between with a Spiro lab II). They found spirometric parameters (FVC, FEV1, FEF25- 75%, PEF, PIF, MVV, and VC) at altitude(3600 m) were significantly increased. PIF, FEV1, FEF25-75%, MVV was not significantly different between 3600m level and 1400m level. They concluded that acute ascent to altitude above 3600m lessens airway resistance that facilitates expiratory airflow and increase majority Spirometric parameters.
Gupta SS (2012) designed a study to assess and compare the effects of yogic training and swimming on pulmonary functions in normal healthy young volunteers. 100 volunteers were inducted into the study and randomly divided into two groups: One group underwent 12 weeks training for yogic exercises and other for swimming. The training and data acquisition was done in small cohorts of 10 subjects each. The subjects were assessed by studying their anthropometric parameters and pulmonary function parameters (FVC, FEV1/FVC ratio, PEFR, FEF25-75%, FEF 0.2-1.2 l and MVV) both before and after training. They found that all parameters showed statistically significant improvements after both yoga and swimming. Comparison of these improvements for different parameters statistically analyzed by unpaired t test or Mann Whitney U test depicted a statistically better improvement in FVC, FEF25-75% and MVV with swimming as compared to yogic exercises. Further they concluded that swimming as a preferred modality of exercise though either yoga or swimming can be advocated as an exercise prescription as both the modalities cause significant improvement of respiratory health. However, other factors like ability of any exercise regime to keep continued motivation and interest of the trainees must be taken into account for exercise prescription.

Persson C et al. (1986) pointed out that there is an urgency to reach a better understanding of the relationship of impaired pulmonary function to disease in order to undertake preventive measures. They concluded that pulmonary function is a long-term predictor for overall survival rates in both genders and could be used as a tool in general health assessment. Pulmonary function was assessed based on Forced Expiratory Volume in 1 second (FEV1) expressed as per cent predicted for the age, sex, height, weight and race. Hence it becomes essential to achieve more efficient lung function as a preventive measure. Sedentary lifestyles could be associated with less efficient pulmonary function.
Involvement in certain physical activities or sports could help in respiratory muscle strengthening and improvement in pulmonary function. In the present study an attempt has been made to analyses and compared pulmonary function of people with sedentary life styles and elite players of Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming with the age ranging of 18-25 years. This was designed to find out whether sportsman develop better pulmonary function than people with sedentary life styles; and if so, how they differ amongst themselves with respect to various spirometric parameters?

1.1 Statement of the Problem

“A COMPARATIVE ANALYSIS OF THE PULMONARY FUNCTIONS BETWEEN SPORTSMAN AND SEDENTARY SUBJECTS”

1.2 Objectives of study:-

1. To find out the Force Vital Capacity (FVC) of sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

2. To find out the Force Vital Capacity (FVC) of non sportsmen.

3. To find out the Forced Expiratory Volume in one second (FEV1) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

4. To find out the Forced Expiratory Volume in one second (FEV1) of non- sportsmen.

5. To find out the Peak Expiratory Flow (PEF) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

6. To find out the Peak Expiratory Flow (PEF) in non sportsmen.

7. To find out the Forced Expiratory Flow (FEF50) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.
8. To find out the Forced Expiratory Flow (FEF50) in non sportsmen.

9. To find out the Forced Expiratory Volume in three second (FEV3) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

10. To find out the Forced Expiratory Volume in three second (FEV3) in non sportsmen.

11. To find out the Forced Inspiratory Vital Capacity (FIVC) of sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

12. To find out the Forced Inspiratory Vital Capacity (FIVC) of non sportsmen.

13. To find out the Peak Inspiratory Flow (PIF) of sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

14. To find out the Peak Inspiratory Flow (PIF) of non sportsmen.

15. To find out the difference in the Force Vital Capacity (FVC) of sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

16. To find out the difference in the Force Vital Capacity (FVC) between non sportsmen and sportsmen of different sports categories.

17. To find out the difference in the Forced Expiratory Volume in one second (FEV1) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basket ball, Volleyball & Swimming.

18. To find out the difference in the Forced Expiratory Volume in one second (FEV1) between non sportsmen and sportsmen of different sports categories.

19. To find out the difference in the Peak Expiratory Flow (PEF) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basket ball, Volleyball & Swimming.
20. To find out the difference in the Peak Expiratory Flow (PEF) between non sportsmen and sportsmen of different sports categories.

21. To find out the difference in the Forced Expiratory Flow (FEF50) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

22. To find out the difference in the Forced Expiratory Flow (FEF50) between non sportsmen and sportsmen of different sports categories.

23. To find out the difference in the Forced Expiratory Volume in three second (FEV3) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

24. To find out the difference in the Forced Expiratory Volume in three second (FEV3) between non sportsmen and sportsmen of different sports categories.

25. To find out the difference in the Forced Inspiratory Vital Capacity (FIVC) of sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

26. To find out the difference in the Forced Inspiratory Vital Capacity (FIVC) between non sportsmen and sportsmen of different sports categories.

27. To find out the difference in the Peak Inspiratory Flow (PIF) of sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

28. To find out the difference in the Peak Inspiratory Flow (PIF) between non sportsmen and sportsmen of different sports categories.
1.3 Hypotheses of the Study:

1. There exists no significant difference in the Force Vital Capacity (FVC) of sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

2. There exists no significant difference in the Force Vital Capacity (FVC) between non sportsmen and sportsmen of different sports categories.

3. There exists no significant difference in the Forced Expiratory Volume in one second (FEV1) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

4. There exists no significant difference in the Forced Expiratory Volume in one second (FEV1) between non sportsmen and sportsmen of different sports categories.

5. There exists no significant difference in the Peak Expiratory Flow (PEF) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

6. There exists no significant difference in the Peak Expiratory Flow (PEF) between non sportsmen and sportsmen of different sports categories.

7. There exists no significant difference in the Forced Expiratory Flow (FEF50) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.

8. There exists no significant difference in the Forced Expiratory Flow (FEF50) between non sportsmen and sportsmen of different sports categories.

9. There exists no significant difference in the Forced Expiratory Volume in three second (FEV3) in sportsmen participating in Athletics (long distance & sprinters), Boxing, Wrestling, Basketball, Volleyball & Swimming.
10. There exists no significant difference in the Forced Expiratory
Volume in three second (FEV3) between non sportsmen and
sportsmen of different sports categories.

11. There exists no significant difference in the Forced Inspiratory
Vital Capacity (FIVC) of sportsmen participating in Athletics (long
distance & sprinters), Boxing, Wrestling, Basket ball, Volleyball &
Swimming.

12. There exists no significant difference in the Forced Inspiratory
Vital Capacity (FIVC) between non sportsmen and sportsmen of
different sports categories.

13. There exists no significant difference in the Peak Inspiratory
Flow (PIF) of sportsmen participating in Athletics (long distance
& sprinters), Boxing, Wrestling, Basket ball, Volleyball &
Swimming.

14. There exists no significant difference in the Peak Inspiratory
Flow (PIF) between non sportsmen and sportsmen of different
sports categories.

1.4 Delimitations of study:-

1. The study was confined to 153 sportsmen of Athletics (long
distance & sprinters), Boxing, Wrestling, Basket ball, Volleyball &
Swimming with the age ranging of 18-25 years and were
engaging in that sport training for ≥16 h per week.

2. The domain of study was delimited to sportsmen belonging to
Universities of Haryana.

3. The study was further delimited to only elite sportsmen, who have
won first/second/third position at national/ inter-university level
during the years of study in the discipline of Basketball, Athletes
(Sprinters) Short Races, Athletes (Long Distance Runners)
Races, Swimming, Volley Ball, Boxing and Wrestling.
4. In the non sportsmen category sample of 129 subjects were taken from the subjects who are pursuing their master degree from any university of Haryana and never ever participated in any competitive sports at any level.

5. In the present study only seven variables of pulmonary function were studied which were Force Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV1), Peak Expiratory Flow (PEF), Forced Expiratory Flow (FEF50), Forced Expiratory Volume in three second (FEV3), Forced Inspiratory Vital Capacity (FIVC) and Peak Inspiratory Flow (PIF) with the help of spirometer.

1.5 **Limitations of the study:**

   The life style, habits, heredity, nutritional intake, physical fitness level, other psychological and physiological variables are beyond control of the research worker. These will be considered as limiting factors of the study.

1.6 **Signification of the Study:**

1. The results of present study will provide strong evidence about the lung function parameters of Indian sportsmen participating in different types of sports/games.

2. The results will provide an insight about the status of lung function parameters of the population who is not participating in any competitive sports.

3. The results will provide any guide line for the physical trainers, physical educators, researchers which type of sports activity have positive impact on the lung function parameters.

4. The study will be a feedback mechanism and will add to the critical literature.