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Chronic aerobic exercise - a boon to pulmonary functions

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ABSTRACT

Regular aerobic exercise enhances physical capabilities and physiological responses of the human body and the lungs are of no exception. On the other hand, impaired respiratory function is associated with various morbidity and mortality. Spirometry serves as a tool to assess the lung functions. So, the present study is aimed at comparing lung function tests of young footballers of Assam medical college and comparing them with sedentary group. A total of 100 subjects comprising footballers and sedentary were assessed for pulmonary function test. The parameters used as determinants of lung function were FVC, FEV1, PEFR and FEV1/FVC ratio, which were recorded as per standard procedure using Medspiror. The results showed a statistically significant increase in the values of FVC, FEV1, FEV1/ FVC and PEFR in footballers compared to sedentary group. This study suggests that regular aerobic exercise plays a pivotal role in improving the lung functions.

KEYWORDS- Aerobic exercise, Footballers, Pulmonary function tests, Sedentary group

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INTRODUCTION:-

Regular exercise leads to numerous and varied physiological changes which improves the quality of life. The American College of Sports Medicine (ACSM) defines aerobic exercise as "any activity that uses large muscle groups, can be maintained continuously, and is rhythmic in nature." It is a type of exercise that overloads the heart and lungs, and causes them to work harder than at rest.[1] Footballer's training session includes rigorous aerobic exercise like walking, jogging, running and skipping. Regular exercise improves cardio-respiratory function and skeletal muscle function. Pulmonary functions are generally determined by the strength of respiratory muscles, compliance of the thoracic cavity, airway resistance and elastic recoil of the lungs.[2] Exploration of the relation between aerobic exercise and lung functions, will aid in understanding the mechanisms of how aerobics improves the overall physical and psychological well-being. Hence the present study was undertaken to study the pulmonary functions of young male footballers and to compare them with age matched sedentary group.

MATERIALS AND METHOD:-

This study was conducted in the Department of Physiology, Assam medical college, Dibrugarh. A total of 50 footballers and 50 sedentary subjects, all students of the Assam medical college, participated in the study. They were aged 17-24 years. Their ages, smoking habits, physical status and health conditions were recorded by using a questionnaire. The ethical committee clearance and an informed consent of the subjects were taken. Footballers training session included aerobic exercise training of 1hr in the morning and 2hrs in the evening daily. Only those footballers were included who had undergone the training for more than 6months. Subjects with clinical abnormalities of the vertebral column and the thorax, diabetes mellitus, pulmonary tuberculosis, bronchial asthma, chronic bronchitis, bronchiectesis, emphysema and malignancy, and those who smokes, chews tobacco and those who had undergone abdominal or chest surgery and those with BMI≥25were excluded from the study. Subject's height and weight were measured and then BMI was derived by Quetelet's index. Measurements were taken between 8 AM and 12 PM to avoid diurnal variations in lung functions. Procedure was explained to each subject before the test. The lung function tests were carried on all the subjects as per the standards mentioned by M.R Miller et al[3,4] by using a Med-spiror (Recorders and Medicare System, Chandigarh). Lung function parameters like Forced Expiratory Volume in 1 second (FEV1), Forced Vital Capacity (FVC), FEV1 / FVC Ratio and Peak Expiratory Flow Rate (PEFR) were recorded.

Data analysis:-

The data was analyzed by using Microsoft Excel and Statistical Package of Social Sciences (SPSS version 20.0). The mean and standard deviation (SD) were calculated and reported for the quantitative variables. The statistical difference in the mean values was tested by using one way ANOVA (analysis of variance) with post-hoc turkey tests. A p-value of < 0.05 was considered as statistically significant.

RESULTS:-

The study population consisted of total 100 individuals included in two different categories namely sedentary group(50) and footballers(50). The mean±SD values of age and anthropometric measurements of both groups are shown in table 1. The findings suggest that the two groups didnot differ significantly with respect to age and anthropometric parametres.

TABLE 1:-Showing the mean±SD of age and anthropometric measurements in study population

PARAMETERS	FOOTBALLERS	SEDENTARY GROUP	p-VALUE	SIGNIFICANCE
AGE(Years)	21±2.4	20±3.3	0.0863	NS
HEIGHT(cm)	1.62±2.56	1.60±3.04	0.9717	NS
WEIGHT(Kg)	54±4.70	55±2.90	0.2034	NS

p value > 0.05 was non-significant (NS);p value < 0.05 was significant(S)

The mean±SD of the various lung function parameters in the study population is shown in table 2. Mean FVC of footballers was higher compared to sedentary subjects and the difference was statistically significant. The result is shown in figure 1.There was also a statistically significant increase in values of FEV1 in footballers as shown in figure 2. Similarly the mean values of FEV1% and PEFR showed a significant increase in footballers as compared to sedentary group as depicted in figure 3 and 4 respectively.

TABLE 2:-Showing mean±SD of the various lung function parameters in the study population

PARAMETRES	FOOTBALLERS	SEDENTARY GROUP	p-VALUE	SIGNIFICANCE
FVC(litres)	4.78±0.62	3.51±0.36	<0.05	S
FEV1(litres)	3.86±0.31	3.06±0.35	<0.05	S
FEV1%	87.21±0.56	80.76±0.83	<0.05	S
PEFR(litres/sec)	8.96±0.44	7.64±0.2	<0.05	S

p value > 0.05 was non-significant (NS);p value < 0.05 was significant(S)

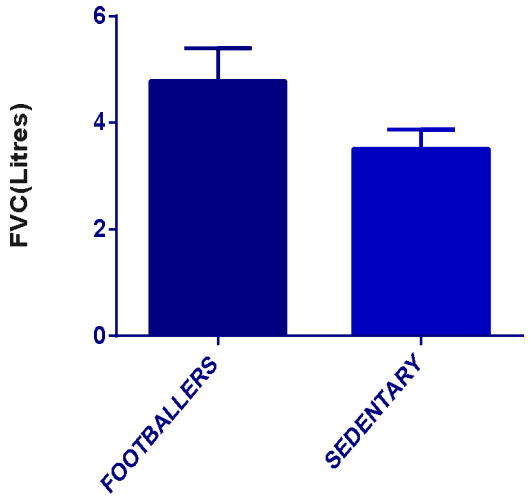

FIGURE 1:- Showing mean±SD of FVC in the study population

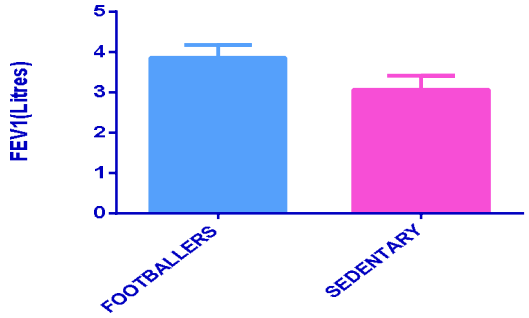

FIGURE 2 :- Showing mean±SD of FEV1 in the study population

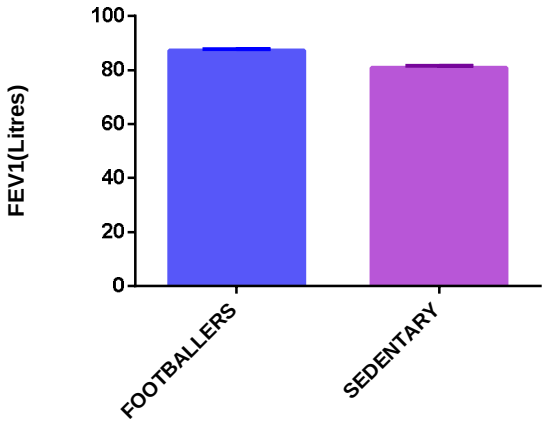

FIGURE 3:- Showing mean±SD of FEV1% in the study population

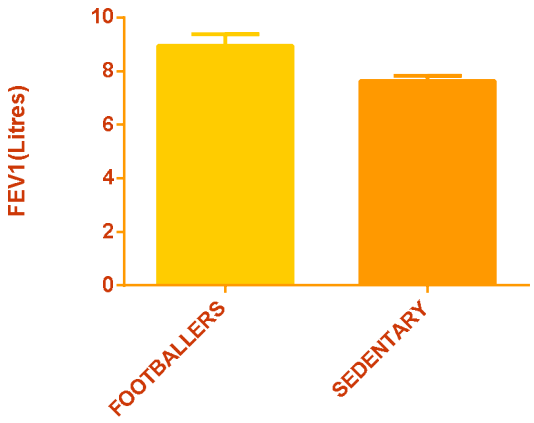

FIGURE 4:- Showing mean±SD of PEFR in the study population

DISCUSSION:-

Results obtained from the present study showed that mean±SD value of FVC in footballers (4.78±0.62litres) was significantly higher than sedentary group(3.51±0.36 litres).similiar results were observed by Onadeko et al[5], Bjorstrom et al[6] and Shivesh Prakash et al[7]. Hagberg[8] reported that values for static lung volumes (TV and FVC) of accomplished marathoners and other endurance trained athletes was not different from those of untrained controls. However, Douglass G and et al. also reported higher mean FVC scores in athletes as compared to non-athletes.

The mean±SD value of FEV1 in footballers and sedentary group was 3.86±0.31litres and 3.06±0.35 litres respectively. The statistically significant increase of FEV1 in footballers which was recorded is in agreement with the findings of Y.J. Cheng et al[9], Riza Farid et al[10] and ShobhaRani Vedala et al[11]; but Olufeyi A. Adegoke et al[12] and Ayesha AK et al[13] did not observe any significant change in FEV1.

Measurements of FEV1% in the present study showed a significant difference in the two groups of study population. Similiar findings were noted by ShobhaRani Vedala et al[11] but, Adegoke OA et al[12] and Hagberg[8] observed no significant differences in between athletes and non athletes.

The conflicting findings may be due to genetic and ethnic factors.

In the present study the PEFR of footballers (8.96±0.44litres/sec) was significantly higher than the sedentary group (7.64±0.2 litres/sec). The increase in PEFR was also reported by Shobha Rani Vedala et al[11] and Chaitra B et al[14].

Lung dimensions, compliance and respiratory muscle power determines the vital capacity, and PEFR is mainly depended on airway caliber, alveolar elastic recoil and respiratory muscle effort.

The period of exercise to bring improvement in PFT varied from 1 month to 8 months reported by various researchers in India. Regular exercise increases the strength and function of muscles, making them more efficient. The increase muscle strength helps the lung to inflate and deflate maximally. This maximum inflation and deflation is an important physiological stimulus for the release of surfactant as stated by Hildebrean et al[15]. The findings of the present study can also be explained on the basis of better functions of respiratory muscle strength, improved thoracic mobility and the balance between lung and chest elasticity which the footballers may have gained from regular exercise.

CONCLUSION:-

In conclusion, the current study has shown that, the pulmonary function parameters were higher in footballer than in the sedentary group indicating that regular exercise produces numerous favourable changes that collectively result in the body being able to work in a far more efficient manner.

Perhaps one of the greatest challenges we face in developed societies is how to facilitate and encourage healthier lifestyles that include regular physical activity. Left unchecked, this problem will contribute to ever-increasing health care costs and higher disease rates. Regular exercise is not the magic bullet in terms of disease prevention, but when combined with a healthy diet, it may be the best intervention currently available to anyone who is willing to get up off the couch.

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