

**Original article:**

## **Pulmonary function tests in chronic alcoholics**

**Dr.Lata Buktar,<sup>1</sup>Dr.Abhay Jagtap,<sup>2</sup>Dr.Hafiz Ansari<sup>3</sup>**

<sup>1</sup>Assistant Professor, Department of Physiology Vasantrao Naik Government Medical College, Yavatmal,India.

<sup>2</sup>Associate Professor, Grant medical college & JJ hospital Mumbai India.

<sup>3</sup>Assistant Professor, Grant medical college& JJ hospital Mumbai India.

Correspondence: Dr.Lata Buktar

---

### **Abstract**

**Introduction:** Pulmonary function tests are the qualitative and quantitative measure of various bronco-pulmonary functions. Alcohol has multitudes of effects on many organ systems, particularly lung, liver, heart and central nervous system. In the present study the subjects who consumes more than 200 ml of country liquor daily at any time of day or night more than 5 years continuously are considered as chronic alcoholics, according to Indian classification of alcohol consumption of urban subjects.

**Methods:** The study was conducted on 120 male subjects belonging to age group 20-60 years of which 60 were chronic alcoholics and remaining 60 were normal healthy subjects who served as age matched controls. Forced expiratory maneuver was carried out in above subjects with the help of "Computerized Medspiror which is high performance pneumotachometer(Recorders and Medicare systems Chandigarh). Three readings were taken and the best of these was taken for calculations. Following pulmonary function tests parameter were recorded ,Forced vital capacity(FVC) and Forced expiratory volume in one second(FEV1) .

**Observations and results:** the results of observed values of FVC, FEV1/FVC% showed a significant decrease ( $P<0.05$ ) in chronic alcoholics as compare to control groups.

**Conclusion:** these findings suggest that chronic alcoholism is dangerous as it impairs pulmonary functions with manifestations of airway obstruction and restriction as evident from determination of pulmonary function tests.

**Key words:** Pulmonary function test, FVC, FEV1/FVC ratio, chronic alcoholics

---

### **Introduction:**

The word alcohol is derived from Arabic word alquhl meaning "Essence" or "Finely divided spirit" [3,4] Significant proportions of male population are regular consumers of alcohol. Regular consumption and high blood alcohol level may cause organ damage mainly lung, liver and central nervous system.

In alcoholics the factors like poor nutrition, frequent infections of respiratory tract, aspiration pneumonitis contribute significantly to high incidence of chronic lung diseases [1,2]. Concentration of alcohol that

reaches the lung may be considerable which in turn either by direct toxicity or by interference with metabolic process may produce cellular injury.[5] After ingestion alcohol first go to liver and then parenchyma of lung which may itself produce pulmonary damage leading to pulmonary emphysema, pulmonary fibrosis, & bronchiectasis.

The criteria for chronic alcoholic patients according to Indian classification of alcohol consumption of urban subjects [6]

- Type of drink – country liquor, Beer, Whisky, Rum
- Quantity – 200 ml, 700 ml, 120 ml

- Frequency – daily, at any time of day & night
- Duration- more than 5 years.

#### **Aims and objectives**

1) To find out the status of respiratory functions in chronic alcoholics.

2) To study the extent of deviations of pulmonary functions in chronic alcoholics as

compared to normal healthy age matched control subjects by using computerized

medspiror and

3) To know whether chronic alcoholics reveal restrictive or obstructive lung disease

or combination of both.

#### **Material and Methods.**

The present study entitled “pulmonary function tests in chronic alcoholics” has been carried out at SRTRMC, Ambajogai. Prior permission from Head of Dept. of Medicine and the Dean of this Institute was obtained. The subjects were selected from medicine OPD and from male medicine ward. The study was conducted on 120 male subjects belonging to age group 20-60 years, of that 60 were chronic alcoholics & remaining 60 were normal healthy subjects, who served as age matched controls.

Chronic alcoholic patients suffering from respiratory diseases like pneumonia, chronic bronchitis, & emphysema were included only after antibiotic treatment ensuring they are free from above respiratory diseases. However patients with lung cancer, cirrhosis of liver, pleural effusion, Chest deformities, lung abscess, tuberculosis, Bronchial asthma were excluded, all the subjects were nonsmokers. Patients who consumed country liquor of 200ml per day, at any time of day/night continuously for at least 5 years were considered as chronic alcoholics. In the present study pulmonary

function tests, were carried with “computerized Medspiror”(Recorder and medicare system Chandigad) which is a high performance pneumotacho-meter capable of giving accurate test results and excellent reproducibility.

Since Co-operation from the subjects is being an important factor, all the subjects were explained in detail the procedure of pulmonary function test along with demonstration prior to the recordings. Proper trials were given to ensure that subjects understand the whole procedure. In the beginning the following data was fed to the instrument age in years, sex, room temperature, standing height in cm and weight in Kg. With the help of this data predicted values of respiratory function parameters being calculated and corrected to BTPs by the instruments itself. Thereafter each subject was asked to perform the Forced expiratory maneuver, In this the subject was asked to take maximum inspiration and then expire forcefully & completely into the mouthpiece connected to the instrument. Three readings were taken and the best of these was taken for calculation.

A printed sheet of pre(observed), predicted and percentage predicted values of all respiratory function parameters were taken, but in the present study only, pre (observed) values are considered for calculation. The instrument was reused with new disposable mouthpiece for the next subjects. The parameters can also be explained with the help of graphical representation in the form of flow/volume plot and volume/time plot. In the present study FVC as a measure of restriction and FEV1/FVC% as a measure of obstruction were taken into consideration, as they are more relevant & pertinent to present study.

**Observation and results:**

Table I: Observed values of FVC in litres in control and chronic alcoholic patients (ALC)

Parameter: FVC in litres								
Age group	21-30		31-40		41-50		51-60	
	Control n=13	ALC n=10	Control n=18	ALC n=19	Control n=15	ALC n=16	Control n=14	ALC n=15
Mean	2.78	1.75	2.81	1.98	2.74	1.83	2.73	1.97
SD	0.22	0.44	0.14	0.23	0.17	0.54	0.18	0.37
t-test	P<0.05		P<0.05		P<0.05		P<0.05	

Table II: Observed values of ratio of FEV1/ FVC% in control and chronic alcoholic patients (ALC).

Parameter: FEV1/FVC %								
Age group	21-30		31-40		41-50		51-60	
	Control n=13	ALC n=10	Control n=18	ALC n=19	Control n=15	ALC n=16	Control n=14	ALC n=15
Mean	98.30	97.56	99.72	97.36	99.60	97.20	99.80	94.00
SD	3.03	4.00	0.80	8.97	1.12	4.00	1.01	7.80
t-test	P>0.05		P>0.05		P<0.05		P<0.05	
Significance	Non-significant		Non-significant		Significant		Significant	

FEV1/FVC% showed a decrease, but the decrease was statistically significant in the age group 41-50 & 51-60.

**Discussion:**

The careful analysis of the observations and result in the present study reveals a significant decline in the observed values of FVC and FEV1/FVC percent. A similar decline in FVC & FEV1 has been reported by Lange and Steffengroth et al [7] where the loss of FEV1 & FVC is greater in alcoholics who consumed more or less 350 gm of alcohol per week. Arther S. Banner [2] Cemil Emirgi [(3), Emirgil and Sohol [8] in their studies found decrease in FEV1 while David Sparrow et al, Rankin and associates in their

respective studies showed an insignificant decrease in FEV1 which is contrary to our study.

The ratio of FEV1/FVC showed a decline which was statistically significant only in chronic alcoholics belonging to age groups 41-50 and 51-60 when compared to normal healthy control subjects. These findings suggest that chronic alcoholism may affect pulmonary functions leading to obstructive disease in the present study. However Rankin et al [9] in their study found reduction in FEV1/FVC ratio in 50% of alcoholics. Cohen et al [10] in cross sectional study of 2539 adults, co-related the degree of airway

obstruction with alcohol consumption, indicated by FEV1/FEC ratio, was significantly lower in heavy drinkers, these findings are in accordance with our results.

Henry 'O' Heinemann [11] in his review, alcohol and lung are reported the effects of acute alcohol excess on bronchial epithelium. The surface of the tracheo-bronchial tree is covered with ciliated and mucus producing cells [12] ciliary motion is affected by chemical factor present in alcohol. Alcohol will limit the transport of carbon particles trapped in the mucus layer overlying the cilia [13], which is the first line of defense mechanism against particulate air pollutant [14,15]. The alveolar macrophages are concerned with cleansing of the tracheo-bronchial tree and the defense against pathogens. Alcohol slows the migration of these phagocytic cells and due to insufficient macrophage mobilization the bacterial capacity is severely decreased [16, 17].

Chronic alcoholism impairs the protective mechanism of the lung, alters the surface tension of their tissue interface which may be responsible for irreversible structural changes in the lung parenchyma [18,19] moreover it leads to interstitial

edema and dilation of blood vessels, with diffusion limitations, this may lead to early airway closure. Excessive consumption of alcohol limits the renewal of dipalmitoylphosphatidyl choline, the surface active phospholipid in the alveolar lining layer, which is essential to stabilize surface tension at various lung volumes, by limiting the incorporation of precursor palmitic acid into phospholipid molecule. Many Japanese patients with asthma experienced [20] episodes or exacerbation of asthma after alcohol consumption this may be due to alcohol elevates blood acetaldehyde levels which leads to degranulation of mast cells (basophils) resulting in release of chemical mediator such as histamine which induces asthma. Thus, the various factors explained above affect small airways and lung parenchyma resulting in decline of pulmonary functions especially FVC, FEV1/FVC ratio.

#### **Conclusion:**

In the present study findings suggest that the chronic alcoholism is dangerous as it impairs pulmonary functions, with the manifestations of airway obstruction and restriction, as evident from the determination of pulmonary function tests.

#### **Acknowledgement:**

I owe a credit and acknowledgement to my post graduates teacher, my parents & Colleagues of SRTRMC, Ambajogai who were very Co-operative throughout my study. I thank all my patients who were the backbone of this study and are always a source of inspiration to me without whom this study was not possible.

#### **References:**

- 1) Oakley S. Ray , Updated, drugs society and human behavior 1974:102-104.
- 2) G.S.Sainani , API-Textbook of medicine Fifth edition-1992, 1112-15.
- 3) Banner A.S., "Alcohol and the lung" Chest, 1980, 77:460-61.

- 4.) Arthur S. Banner, "Pulmonary function tests in chronic alcoholism", *American Review of Respiratory Disease*, Vol. 108, 1973:
- 5.) George E. Burch, Nicholas P. De Pasquale, "Alcoholic lung disease-An hypothesis", *American Heart Journal*, Feb 1967, Vol. 73, No. 2: 47-50.
- 6.) R. B. Singh, S. Ghosh, M. A. Niaz, V. Rastogi, G. S. Wander, "Validation of tobacco and alcohol intake questionnaire in relation to food intakes for the five city study and a proposed classification for Indians", *JAPI* 1998, Vol. No. 4 (587-94)
- 7.) Lange, Steffen Groth, Jann Mortenson, Merete Appleyard, Jorgen Nyboe, Jensen and Peter Schnour. "Pulmonary function is influenced by heavy alcohol consumption", *American Review of Respiratory disease* (1998), 137: 1119-1123.
- 8.) Emirgil, Bruce J. Sobol, Bernard Heymann, Kinichi Shibutani, Anne Red, Alberta Varble, Janet Waldie, "Pulmonary function in alcoholics", *Chest*, 72, July, 1977: 45-51.
- 9.) David Sparrow, Bernard Rosner, Michel Cohen and Scott T. Weiss, "Alcohol consumption and pulmonary function", *American Review of Respiratory disease*, 198, 127: 735-38
- 10.) Rankin J. G., Hale, J. S. Wilkinson, P. O. Day, D. M. Santamaria et al., "Relationship between smoking and pulmonary disease in alcoholism", *Med. J. Aug.* 1969, 1: 730.
- 11.) Bernice H. Cohen, David D. Celentano, Garry A. Chase, Earl L. Diamond, Carol J. Graves, David A. Levy, Harold A. Menkes, Mary B. Mayer, Solbert Permult, Melvyn S. Tockman "Alcohol consumption and airway obstruction", *American Review of Respiratory Disease*, Vol. 121, 1980: 205-15
- 12.) Heinemann H. O. "Alcohol and the lung-A brief review", *Am. J. Med.* 1977, Vol. 63: 81-84.
- 13.) Rhodin Jag, "Ultrastructure and function of the human tracheal mucosa", *Am. Rev. Respir. Dis.*, 93: 1, 1966.
- 14.) Green G. M., Pulmonary clearance of infectious agents *Ann. Rev. Med.* 19: 315, 1968
- 15.) Laurenzi G. A., Guaneri J. J., The study of the mechanism of pulmonary resistance to infection-the relationship of bacterial clearance to ciliary and alveolar macrophage function, *American Rev. Respirator disease* 1966, 93: 134.
- 16.) Kilburn K. H., Cilia and mucus transport as determinants of the response of lung to air pollutants *Arch. Environ. Health*, 14: 77, 1967.
- 17.) Gee J. B. L., Kaskin J., Duncombe M. P. et al., The effects of ethanol on some metabolic features of phagocytosis in the alveolar macrophage *J. Reticuloethanol Soc.* 15: 61, 1974.
- 18.) Green G. M., Kass E. H., The influence of bacterial species on pulmonary resistance to infection in mice subjected to hypoxia, cold stress and ethanolic intoxication, *Br. J. Exp. Pathol.*, 46: 360, 1965.
- 19.) Lieber C. S., The metabolism of alcohol *Sci., Am* 1976: 234, 25.
- 20.) Shimoda T., Kohno S., Takao A., Fujiwara E. et al., Investigation of the mechanism of alcohol induced bronchial asthma, *J Allergy Clin. Immunol.* 1997: 74-84.