International Journal of Biology Research
ISSN: 2455-6548, Impact Factor: RJIF 5.22
www.biologyjournal.in
Volume 2; Issue 3; July 2017; Page No. 27-28

Alteration in total antioxidant capacity of plasma in alcohol consuming COPD patients

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Abstract
Chronic Obstructive Pulmonary Disease (COPD) is a major reason of chronic morbidity and mortality worldwide. Alcohol over consumption damages virtually each organ within the body and predisposes the host to wide range of infectious diseases like acute metabolic process distress syndrome (ARDS), pneumonia and COPD. In the presnt study a total of 40 subjects were analysed out of which 21 were alcohol consuming COPD patients and 19 controls matched with respect to age, lifestyle and socioeconomic status and alcohol drinking habit. FRAP assay was used to analysed the total antioxidant ability of plasma. Markedly significant difference was reported in the mean FRAP value of alcohol consuming COPD patients as compared to the control subjects.

Keywords: COPD, ARDS, FRAP

Introduction
Chronic Obstructive Pulmonary Disease (COPD) is a major reason of chronic morbidity and mortality worldwide (GOLD 2009) [1]. COPD is characterized by irreversible limitations of airflow and associated with an abnormal inflammatory response of the lung to gases and noxious particles (GOLD, 2009; Nadeem *et al.*, 2005) [1, 2]. Alcohol over-consumption is the fourth leading preventable reason for death, inflicting over 88,000 deaths every year in U.S. (Gonzales *et al.*, 2014) [3]. Alcohol over consumption damages virtually each organ within the body and predisposes the host to wide range of infectious diseases like acute metabolic process distress syndrome (ARDS), pneumonia and COPD (Liang *et al.*, 2012; Pabst *et al.*, 2011) [4, 5] Chronic alcohol intake depletes the antioxidant glutathione (GSH) throughout the alveolar lining fluid of the lung and within macrophages (Liang *et al.*, 2012) [4].
Oxidative stress is seems as central feature of alcohol over-consumption related tissue damage and mechanism of alcoholic lung disease. (Halliwell, 1996; Heffner and Repine, 1989) [6,7]. Alcohol oxidative metabolism to acetaldehyde generates a series of reactive oxygen species (ROS) and free radicals, which decrease the system's ability of body to detoxify the ROS generated reactive intermediates or their products (Cederbaum, 2010) [8]. The most crucial ROS of physiological significance are hydroxyl radical (OH•), superoxide anion (O_2•-), hydrogen peroxide (H_2O_2) and nitric oxide (NO•). The most reactive and harmful of all these is the hydroxyl radical (OH•) (Hakhamaneshi *et al.*, 2007) [9]. Smoking also enhanced the production of ROS in lungs (Church *et al.*, 1985) [10]. Oxidative stress is proposed to play a crucial role in the pathophysiology of COPD (Rahman *et al.*, 2002) [11].
The Ferric reducing ability of plasma (FRAP) assay is a rapid and novel method for analyzing total antioxidant ability of plasma. The FRAP assay measures the Ferric to ferrous ion reduction in the presence of antioxidant at low pH and formation of a blue coloured ferrous tripyridyltriazine (TPTZ) complex. The present study was performed to analyse the total antioxidant power of plasma with the help of FRAP assay in alcohol consuming COPD patients and matched controls.

Materials and methods
Subjects
A total of 40 subjects were analysed out of which 21 were alcohol consuming COPD patients and 19 controls matched with respect to age, lifestyle and socioeconomic status and alcohol drinking habit. COPD patients were diagnosed by a registered medical practitioner. The study was carried out in Human Genetics Laboratory, Department of Zoology, Kurukshetra University. A detailed questionnaire was filled by COPD patients and controls to collect details regarding their sex, age, alcohol drinking habit. Ethical clearance was obtained from Institutional Ethics Committee, Kurukshetra University, Kurukshetra (No. IEC/14/371) dated-October 1, 2014 for the present study. An informed consent was obtained from each subject before blood sampling.

Sample collection and laboratory analysis
Blood samples were obtained by a registered medical practitioner from the vein of the subjects and taken to laboratory in K_2 EDTA coated vials and centrifuged at 2500 rpm. FRAP assay was used to measured the total antioxidant ability of plasma (Benzie and Strain, 1996) [12]. 100 µL of plasma was mixed with 300 µL distilled water and 3 mL of working FRAP reagent which was freshly prepared by adding 10:1:1 ratio of 300 mmol/L acetate buffer, 10 mmol/L 2, 4, 6-tripy ridyl-S-triazine (HIMEDIA) in 40 mmol/L HCl and 20 mmol/L $FeCl_3 \times 6H_2O$ (HIMEDIA). Ascorbic acid was taken as standard. Absorbance was measured at 593 nm at zero minute after vortexing. Then samples were placed in a water bath at 37 ˚C and absorbance was taken after 4 minutes.

Results
The general and clinical characteristics of the subjects are given in the Table1. The mean age of alcohol consuming COPD patients was 53.524±3.190 years very similar to that of

alcohol consuming control subjects 50.789±3.492 years. Markedly significant difference (p>0.001) was reported in the mean FRAP value of alcohol consuming COPD patients 350.710±13.428 as compared to control subjects 761.840±16.948. Figure 1 depicts the Mean value of FRAP in alcohol consuming COPD patients and control subjects.

Table 1: General and clinical characteristics of the subjects.

Characteristics	Controls (Alcoholics)	COPD patients (Alcoholics)
N	19	21
Age (years)	50.789±3.492	53.524±3.190
FRAP values (µmol/L)	761.840±16.948	350.710±13.428*

*Significant (p<0.001), unpaired Student's t-test.

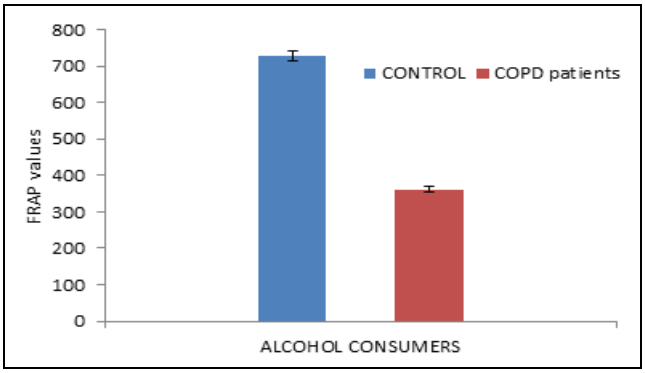

Fig 1: Ferric reducing antioxidant power of plasma (µmol/ml) in alcohol consuming COPD patients and controls.

Discussion

The increased consumption of alcohol leads to the production of ROS. High levels of ROS results into oxidative stress which causes severe damage to the biological macromolecules (Kandi *et al.*, 2014b) [12] mutation in DNA, impairs cell proliferation (Kandi *et al.*, 2014a) [13]. Subhani *et al.*, 2009 [14] proposed that chronic alcohol intake produces a wide range of liver and other organ diseases depending on the amount and duration of alcohol consumption. In the present study we have observed increase level of oxidative stress in alcohol consuming COPD patients as compared to the control subjects. Kandi *et al.*, 2014a [13] have reported an increase in level of oxidative stress and a decrease in antioxidant status of alcohol consumers. Lecomte *et al.*, 1994 [15] also observed increased level of oxidative stress in alcohol consumers. From the finding of the present study it can be concluded that alcohol consuming COPD patients have lower antioxidant ability of plasma and higher level of oxidative stress as compared to the alcohol consuming control subjects.

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