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Levels of plasma testosterone, antioxidants and oxidative stress in alcoholic patients attending de-addiction centre

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Abstract

In men chronic heavy drinking interferes with reproductive hormones which are responsible for sexual maturation, sperm development and fertility. Alcohol is directly toxic to the testes; causing reduced testosterone levels.The present study was designed with an aim to elucidate the effect of oxidative stress on plasma testosterone level and hypothalamic pituitary gonadal (HPG) axis function in alcoholics. The plasma testosterone, luteinizing hormone and follicle stimulating hormone were investigated in alcohols (n=200) (25–45 years) and were compared with normal nonalcoholic controls (n=160). Alcohol abusers displayed significantly lower levels of plasma testosterone, luteinizing hormone, follicle stimulating hormone, Vitamin C, Vitamin E, ß-Carotene, Glutathione and Superoxide Dismutase, Glutathione Reductase activities accompanied with significantly higher levels of Protein carbonyl content and Malondialdehyde levels than controls (P<0.001).Decreased serum testosterone level in alcoholics might be due to increased oxidative stress and decrease in antioxidant levels.

Keywords: Testosterone, Antioxidants, Oxidative stress, Alcohol.

Introduction

The association of humans with alcohol is from times immemorial. Alcohol permeates, pleases and plagues the world. The social evil, despite its ill effects, has lot of charm and attracts the society. Alcoholism can lead to various medical complications, like perturbed alcohol metabolism, liver cirrhosis and hormonal changes associated with pancreatitis, osteoporosis, immune impairment and impaired fertility (NIH Guide, 1997). Evidence continues to grow indicating that reactive Aldehydic products resulting from ethanol-induced oxidative stress play a pivotal role in the pathogenesis of alcoholic liver injury ((Lieber, C. S and De Carli, L. M. 1970; Lieber, C. S and De Carli, L. M. 1972; Cederbaum, A. I et al., 1975). Reactive aldehyde and hydroxyl radicals, which may be generated during periods of heavy ethanol intake, are known for their ability to attack amino acid residues of proteins, thereby forming both stable and unstable adducts with proteins and cellular constituents. As a consequence, cellular functions may become disturbed together with damage to proteins,

nucleic acids and lipids (Lieber Charles S.1997; Clot Paolo et al., 1997).

Alcohol abuse impairs reproductive activity (Maneesh M et al., 2005). Alcoholics are often found having fertility abnormalities with low sperm count and impaired sperm motility (WHO laboratory manual for the examination of human semen and sperm-cervical mucus interaction. 3rd ed. Cambridge Univ. Press, Cambridge; 1992). It causes impaired testosterone production, enormous testicular oxidative stress and testicular atrophy. The male reproductive system consists of three parts: hypothalamus, anterior pituitary and the testes and is finely controlled through a classic negative feedback mechanism (Remzi Cevik et al., 2004). The hypothalamus and anterior pituitary have solely regulatory functions, mediated by its hormones. Based on the observations from the experimental study that alcohol causes gonadal dysfunction(Maneesh M et al., 2005), the present study was designed with an aim to elucidate the effects of alcohol induced oxidative stress on plasma testosterone level and hypothalamic pituitary gonadal (HPG) axis function in alcoholic patients by estimating the levels of Serum Testosterone, LH , FSH along with erythrocyte Malondialdehyde, Protein Carbonyl content, Serum Vitamin C, Vitamin E, ß- Carotene, blood Glutathione and erythrocyte Superoxide Dismutase , Glutathione Reductase activities.

Materials and Methods

All experiments were performed as per accordance with Institutional Ethical Review Committee, Grant Medical College & Sir J .J. Groups of Hospitals, Byculla, Mumbai and informed consent was obtained from subjects.

In present investigation, attempts were made to design a discrimination procedure to separate alcoholics from patients with non-alcoholic hepatic diseases using a combination of the most promising test. The most powerful discrimination model was constructed with the batteries of screening instruments for detecting alcohol problems. CAGE (Ewing, J. A. 1984; Ewing, J. A. and Rouse, B. A. 1970; Mayfield, D et al., 1974) Michigan Alcohol Screening Test (MAST) (Selzer, M .L., 1971; Selzer, M.L et al., 1975) Alcohol Use Disorder Identification Test (AUDIT) ((Babor, T.F et al. 1992; Bohn, M.J et al., 1995) and Severity of Alcohol Use Disorder Data (SADD)((Stockwell, T et al., 1994) .Patients between 25 and 45 years of age, willing to participate in the study and with no history of undergoing long term medical intervention for various reasons like Cancer, Diabetes, Advance alcohol liver disorder, Acute Respiratory Distress (ARD), Chronic Renal Failure (CRF) and other Cardio Vascular Disease (CVS) serious medical, surgical, neurological conditions were included in the study. Also, patients with acute Psychotic state were excluded. Alcoholic patients (n=200) attending the deaddiction center who met the following inclusion criteria's and gave their informed consent were included in the study.

Results

Alcoholic patients displayed significantly low levels of serum Testosterone, LH, FSH, with significantly lower levels of dietary antioxidant vitamins like Vitamin C, Vitamin E, ß- Carotene and endogenous antioxidant like blood Glutathione (P<0.001). Antioxidant enzymes like erythrocyte Superoxide Dismutase and Glutathione Reeducates displayed diminished activities (P<0.001) compared to their respective nonalcoholic healthy controls

Discussion

Alcohol intoxication caused marked decrease in serum testosterone level, with simultaneous; increase in lipid peroxidation (MDA concentration) and oxidative damage of protein (Carbonyl content). Reduction in testosterone was accompanied by low LH and FSH. Reduction in the serum testosterone could be due to decreased synthesis (Maneesh M et al., 2005). Current study on the erythrocyte Malondialdehyde (MDA) content as an index of lipid peroxidation in alcoholic groups and their respective controls.

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