

## PHYSIOLOGICAL ASSESSMENT OF MALE ALCOHOLISM

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### ABSTRACT

*In 100 consecutive male inpatients with alcohol dependence and an equal number of age, sex, occupation and regional background matched controls, the value of gamma-glutamyl transpeptidase (GGT), serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), mean corpuscular volume (MCV) and serum triglycerides were statistically significantly raised among alcoholics on admission as compared to controls. After five weeks of enforced abstinence in hospital the values of GGT, SGOT and SGPT showed significant reduction among alcohol consumption, these objective laboratory tests can be used to support the clinical diagnosis of alcohol dependence. Electrocardiographic abnormalities viz. Sinus tachycardia, intraventricular conduction defects, T wave abnormalities and QTC prolongation occurred significantly more frequently in alcohol dependence patients as compared to normal controls.*

*Key Words: Alcohol dependence, laboratory tests, electrocardiogram*

Alcohol use in the Armed Forces is perhaps as old as the Armed Forces themselves. Although concrete data are not available, alcohol users are apparently proportionately more in the Armed Forces than in the general population. None of the available epidemiological studies in India have studied the Armed Forces separately or compared them with the general population. However, the Armed Forces are considered a 'privileged class' and there are more users among soldiers than in the general population (Singh, 1989). This is perhaps so because of easy availability of alcohol, a permissive, rather persuasive environment, and traditional use in certain circumstances. In clinical practice in Armed Forces Hospitals, the diagnosis of alcohol dependence is based mainly on the history obtained from the patient, his unit report and clinical examination. The patient is usually unreliable, the unit report is often equivocal, and the clinical examination may not be informative.

Unbiased assessment of the patient, therefore, is often difficult and rather subjective. In these circumstances an objective laboratory test for the assessment of alcohol dependence would be of great value. Certain biochemical values are abnormal among alcohol dependent individuals. In the absence of gross physical or psychological morbidity values of GGT, MCV, SGOT and SGPT have been claimed to be efficient indicators of alcoholism. Further it has been found that abstinence from alcohol results in reversal of biochemical and hematological values (Whitehead et al., 1978; Ray, 1989; Desai, et al., 1999). However, few other studies have rejected these claims (Latham, 1986).

Alcohol may produce demonstrable cardiac dysfunction even when ingested by normal individuals in quantities consumed in social drinking (Wynn & Braunwald, 1997). Despite the evidence that alcohol may protect against ischemic

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heart disease, death due to cardiovascular disease remains the most important cause of mortality in alcoholics. Heart disease related to alcohol may have an arrhythmia as the initial manifestation. Cardiac arrhythmias developing in these circumstances are often considered idiopathic in origin since little or no clinical evidence may remain after resolution of the arrhythmia. Electrocardiographic abnormalities are common in alcoholics and are frequently the only indicator of alcoholic heart disease during the asymptomatic phase (Day et al., 1993; Wynne & Braunwald, 1997).

There is paucity of Indian work in this field and no work has been carried out in the Armed Forces. This prompted us to focus on few laboratory tests and electrocardiogram (ECG) in an effort to establish an objective test which would help in the diagnosis of armed forces patients with alcohol dependence and study the ECG changes in alcohol dependent subjects without overt cardiac disease.

### MATERIAL AND METHOD

One hundred consecutive male inpatients admitted to the psychiatric centers of two Base Hospitals and meeting the DSM IV criteria (APA, 1994) for alcohol dependence were included in the study with their informed consent. An equal number of age, sex and regional background matched subjects without any physical or psychiatric illnesses formed the control group.

Exclusion criteria for patients and controls were as under:

1. Known cases of cardiorespiratory disease, hypertension and diabetes.
2. Clinical evidence of cirrhosis, hepatocellular failure and portal hypertension.
3. Dehydration and obvious malnutrition.
4. Clinical, radiological and echocardiographic evidence of cardiomegaly.
5. Use of phenothiazines, antidiabetics, antihypertensives, antitubercular drugs, antibiotics, and anticonvulsants during past one month.

Each patient and control subject was examined independently by two psychiatrists to confirm the diagnosis and the absence of exclusion criteria, and was included in the study only after the concurrence of both. A physician carried out a symptomatic analysis pertinent to the cardio-vascular system. Detailed history about the alcohol habit was obtained from the patient on a specially prepared proforma. Additional information was obtained from family members (if available), colleagues and his unit.

Within 24 hours of admission blood for laboratory tests was collected in an overnight fasting condition. The following laboratory tests were performed: serum bilirubin, serum proteins, serum albumin, SGOT, SGPT, GGT, MCV, uric acid, urea, creatinine, electrolytes, cholesterol and lipid profile. ECG evaluation of all patients was performed within 24 hours of admission. A physician subjected the ECGs to blind evaluation. The corrected QT interval (QTc) was estimated by Bazett's formula. The control subjects also underwent all the tests given to the patients. All the alcohol dependent patients were hospitalized for six weeks during which period they were detoxified, withdrawal symptoms were managed and vitamin supplements were administered. A strict abstinence was ensured. Before discharge from hospital i.e. five weeks after the initial testing, GGT, SGOT, SGPT, and MCV were repeated on the alcoholic patients. Statistical analyses were carried out using the student's "t" test and chi-square test with Yates correction as appropriate.

### RESULTS

Mean age of the patients and control subjects was 38.05 years and 38.57 years respectively. Range of age was 25-54 years for both groups. Socio-demographic characteristics and blood group of patients and controls are shown in Table 1. There were no significant differences between the two groups on any of these variables and also in their blood group. Onset of alcohol use in the majority (83%) of alcohol dependent subjects was after joining the

security forces. The majority of subjects (78%)

**TABLE 1**  
**DEMOGRAPHIC CHARACTERISTICS OF ALCOHOL**  
**DEPENDENT PATIENTS (N=100) AND NORMAL**  
**CONTROLS (n=100)**

Characteristic	Alcoholics	Controls	Comparison
<u>Age distribution</u> (in years)			
21-25	1	1	
26-30	25	25	
31-35	18	19	
36-40	22	24	NS
41-45	14	13	
46-50	18	16	
51-55	2	2	
<u>Service (in years)</u>			
6-10	15	16	
11-15	31	32	
16-20	19	19	NS
21-25	22	21	
26-30	13	12	
<u>Rank</u>			
Officers	4	2	
JCOs	11	9	
NCOs	46	48	NS
Other ranks	39	41	
<u>Marital status</u>			
Married	93	92	
Unmarried	7	8	NS
<u>Education</u>			
Upto class 5	11	8	
Class 6 to 10	67	69	
Class 10 & above	22	23	NS
<u>Religion</u>			
Hindu	79	74	
Sikh	14	18	
Christian	5	2	NS
Muslim	2	1	
<u>Domicile</u>			
Rural	91	89	
Urban	9	11	NS
<u>Blood groups</u>			
A	25	31	
B	33	35	
O	36	27	
AB	6	7	NS

had begun voluntarily, while 22% claimed to have done so due to peer pressure. The average daily intake of alcohol as stated by the patients was 71.36 gms. The mean duration of drinking was 14.7 years (Range 5-28 years). The frequency of consumption was: daily in 48% patients, 3-5

times a week in 41% patients, while 11% patients gave a binge pattern of drinking. The majority of alcohol dependent patients (72%) consumed alcohol alone while 28% claimed to drink only in company.

Laboratory test results of the alcohol dependent patients and control subjects are given in table 2. The sensitivity, specificity and predictive value of GGT, SGOT, SGPT & MCV for alcohol dependence are shown in Table 3. While all four tests had high specificity only GGT had high sensitivity. Electrocardiographic abnormalities (excluding prolonged QTc) were noted in 61 patients and 9 controls, the difference being highly statistically significant ( $X^2= 59.4$ ;  $df=1$ ;  $p<0.01$ ). The types of electrocardiographic abnormalities observed in patients and controls are shown in Table 4.

## DISCUSSION

The sample of alcohol dependent patients of the study was drawn from a fairly large area and the rank distribution represents all ranks of the Armed Forces (Table 1). All cases were between 18 to 55 years of age, which are the ages of recruitment and retirement respectively. The mean age was 38.5 years, which excludes biochemical and hematological changes due to old age. By applying strict exclusion criteria the sample formed a sub-group of alcohol dependent men who had no demonstrable physical ailment. Generally it is this sub-group of alcohol user/dependents who escape detection, are deprived of intervention and are usually difficult to assess. Those having significant physical or psychiatric ailment otherwise come to medical attention and get treatment for alcoholism along with the other ailments. The control group was evenly matched with the patient group in all respects. Although many of them were current users, they did not have alcohol dependence nor could they be labeled as problem drinkers. They were apparently healthy in all respects and can be said to be representative of normal security forces personnel.

Values of GGT, SGOT, SGPT and

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**TABLE 2**  
**LABORATORY TEST RESULTS OF ALCOHOL DEPENDENT PATIENTS (N=100)**  
**AND NORMAL CONTROL SUBJECTS (n=100)**

Test (Reference value)	Alcoholics on admission Mean (SD)	Controls (II) Mean (SD)	Alcoholics after abstinence(III) Mean (SD)	Comparisons	
				I vs II	I vs III
GGT(4-23 IU/L)	70.36(53.78)	18.70(8.24)	23.84(13.47)	P<0.01	P<0.01
SGOT (5-35 IU/L)	34.63(23.82)	20.73(8.56)	22.43(8.65)	P<0.05	P<0.05
SGPT(8-40 IU/L)	39.15(29.52)	24.45(7.83)	26.61(9.47)	P<0.05	P<0.05
MCV(80-98cu. microns)	97.62(21.3)	89.13(6.48)	95.17(13.34)	P<0.01	NS
S. Bilirubin(0.2-1.0 mg%)	0.68(0.26)	0.46(0.16)	-	NS	-
Total proteins(6-8 g/dl)	6.82(0.53)	6.04(0.31)	-	NS	-
Albumin(3.7-5.3 g/dl)	4.12(0.49)	3.97(0.44)	-	NS	-
Uric acid(2-7 mg/ dl)	4.27(0.51)	4.13(0.47)	-	NS	-
Cholesterol(150-250mg%)	199.2(61.8)	180.8(32.4)	-	NS	-
HDL(30-63mg%)	44.91(8.69)	42.26(8.87)	-	NS	-
Triglyceride(10-150 mg%)	130.36(48.77)	103.43(30.19)	-	P<0.05	-
LDL(65-165mg%)	137.17(72.73)	121.4(33.31)	-	NS	-
Urea (13-43mg%)	20.53(6.13)	18.62(5.37)	-	NS	-
Creatinine (0.1-1.6mg/dl)	0.75(0.27)	0.64(0.21)	-	NS	-

NS= Not significant

triglycerides were raised among the alcoholics and attained statistical significance when compared with control groups (Table 2). GGT and MCV were highly statistically significant ( $P<0.01$ ). All the other values were within normal limits and not statistically significantly different from the

controls. These findings are in agreement with Whitehead et al. (1978), Ray (1989), Desai et al (1996), Vaswani et al (1997), and Wetterling et al (1998). When compared with the sample taken after 5 weeks of abstinence there was a reduction of values in almost all the parameters but only

GGT, SGOT & SGPT showed a significant reduction (Table 2). Few authors (Whitehead *et al.*, 1978) have reported similar observations.

**TABLE 3**  
SENSITIVITY, SPECIFICITY AND PREDICTIVE VALUES FOR ALCOHOL DEPENDENCE OF GGT, SGOT, SGPT AND MCV (ALL FIGURES IN PERCENTAGES)

	GGT	SGOT	SGPT	MCV
Sensitivity	73	39	22	31
Specificity	95	98	99	100
False Positive rate	5	2	1	0
False negative rate	27	61	78	69
Positive predictive power	93.6	95.1	95.7	100
Negative predictive power	77.9	61.6	55.9	59.2
Overall diagnostic power	84	68.5	60.5	65.5

**TABLE 4**  
ELECTROCARDIOGRAPHIC ABNORMALITIES IN ALCOHOL DEPENDENT PATIENTS (n=100) AND NORMAL CONTROLS (n=100)

Electrocardiographic Abnormalities	Alcohol dependent Patient	Normal Controls
Sinus tachycardia*	14	1
Sinus bradycardia	11	7
Sinus arrhythmia	2	1
Atrial premature beats	3	-
Ventricular premature beats	5	-
Atrial fibrillation	4	-
Intraventricular *	9	1
Conduction defects		
ST depression*	4	1
T wave inversion *	8	-
Tall T waves*	9	1
U wave	2	-
QTc prolongation *	22	2

\*P<0.05

The usefulness of a laboratory test can be compared using the concept of sensitivity, specificity and predictive power. The result show that GGT stands out among the parameters cited as useful indicators of alcohol dependence (Table 3). In addition GGT is also an indicator of abstinence from alcohol (Table 2). Thus GGT can be of help in the diagnosis as well as follow-up assessment of alcohol dependence, particularly in cases where information from other sources

are equivocal or unreliable (Whitehead *et al.*, 1978; Pol *et al.*, 1990; Wetterling *et al.*, 1998). SGOT, SGPT and MCV can perhaps be used as supplementary tests. These findings are in disagreement with Latcham (1986) who found GGT and MCV to be of little value in identifying problem drinkers or severe dependence. However in the same study, Latcham (1986) observed that serial values of GGT and MCV may be useful in monitoring the progress of problem drinkers, though they may not add to the initial clinical assessment. To this extent it is in agreement with the findings of the present study.

In a study on an industrial population, Whitehead *et al.* (1978) discussed the utility of GGT in annual medical examination and found that this has significance when taken with the clinical data. Annual medical examination is a routine in the armed forces. It is therefore felt that GGT, MCV, SGOT & SGPT will be of immense value in annual/periodic medical examinations particularly in suspected cases of alcohol abuse/dependence.

The high incidence of ECG abnormalities in alcoholics in the present study is in agreement with earlier studies, which reported that conduction defects and rhythm disturbances are frequently seen in chronic alcohol consumers (Wynne & Braunwald, 1997). However, in the present study only intraventricular conduction defects and ST-T abnormalities were significantly high in alcoholics as compared to the normal controls which is in agreement with some earlier studies (Regan *et al.*, 1990). An interesting observation was the presence of tall T-waves in 11% of the cases. These have been described as an incidental finding in psychotic patients (Mariott, 1989).

Prolongation of QTc in chronic alcoholics has been reported in earlier studies, but most of these studies were uncontrolled while few studies included patients with clinically overt cardiomyopathy (Day *et al.*, 1993). These drawbacks were avoided in the present study by excluding patients with overt cardiac disease and including a demographically well-matched control group. Epidemiological studies have shown an

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increased incidence of sudden deaths in alcoholics with and without liver disease. A recent study (Day et al., 1993) established that QT prolongation might predict the risk of sudden death in chronic alcoholics. QT prolongation is a known risk factor for lethal arrhythmias. Whether abstaining from alcohol can reverse QT prolongation or whether other interventions can reduce the risk is unknown. However, beta-blockers, which favorably influence prognosis in other congenital and acquired long QT conditions, have been associated with improved survival when given to patients with alcohol liver disease and portal hypertension. This effect was attributed solely to their ability to reduce portal pressure but an anti-arrhythmic action might also be operative (Day et al., 1993). Obviously the identification and treatment of QT prolongation in alcohol dependence patients may help reduce mortality and morbidity.

We conclude from study that GGT, MCV, SGOT & SGPT are objective indicators of alcohol dependence. GGT can also be used for follow-up. In addition these tests can be useful adjuncts to clinical examination for the assessment of alcohol dependence during annual medical examinations. Since ECG abnormalities occur frequently in alcohol dependence, routine ECG of alcohol dependent patients especially of older age group would be useful.

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