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Effect of the permissive sociocultural consumption of alcohol on selected biochemical markers of liver function in the serum of some Nigerian drinkers

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To investigate the health risks associated with the permissive sociocultural use of alcohol by the vast majority of the inhabitants in the Edo-Delta Region of Nigeria, one hundred and fifty habitual drinkers of alcohol were randomly selected from the major tribes in the Edo-Delta area of Nigeria. Tribal breakdown indicates that 40%, 30%, 23% and 7% were Urhobos, Binis, Ibos and Ukwanis, respectively. These test subjects were males between the ages of 25 and 50 who had been drinking for varying lengths of time and had an average daily intake of about 1.2g ethanol/kg body weight. Sixty sex- and age-matched individuals in apparent good health who do not consume alcohol were included as the control subjects. The results obtained showed the meanSEM (mol/L) plasma total bilirubin for the control group and drinkers to be 16.00.9 and 17.52.7 respectively, while the mean SEM (mol/L) plasma conjugated bilirubin for the control group and alcohol drinkers was 10.20.3 and 7.252.6 respectively. The meanSEM (IU/L) plasma alkaline phosphatase (ALP), aspartate aminotranserase (AST), and alanine aminotransferase (ALT) activities for the alcohol drinkers were 84.55.2; 53.44.1, and 50.05.0, but those for the control subjects were 58.43.2; 9.11.5, and 11.01.7. The differences demonstrated in the enzymes' activity values were significant ($P<0.05$). The data suggest a significant measure of liver dysfunction among the alcohol drinkers who are yet to manifest any recognisable physical symptoms of alcohol toxicity. Thus, a permissive attitude to alcohol consumption is associated with a high risk of health disturbances. An

enlightenment campaign should be initiated and the government should establish rehabilitation programmes and centres.

1. Introduction

The liver is the principal site of alcohol metabolism. Hepatic vein catheterisation studies have shown that approximately 75% of a dose of alcohol is eliminated by hepatic metabolism (Lieber, 1997). In addition to alcohol dehydrogenase (ADH), alcohol may be oxidised by the NADPH-dependent microsomal ethanol oxidising system (MEOS) (Peters, & Preedy, 1998).

The majority of the inhabitants in the Edo-Delta Region of Nigeria have various reasons for drinking alcohol. Such reasons could be social or cultural. In the Edo-Delta Region of Nigeria, alcohol is a social lubricant used to conquer fretting, anxiety, and emotional conflicts, possibly because of its euphorigenic effect, and, since the local culture permits such use, cases of alcoholism are not uncommon in these areas.

Alcoholism is the most serious form of alcohol abuse, especially in the Edo-Delta Region of Nigeria, where it has been observed that alcohol dependence leads to physical violence, financial insecurity, increasing psychiatric morbidity, and liver diseases (Onyesom, & Naiho, 2006). Liver diseases have been reported (Lieber, 1994) to be the leading cause of death among alcoholics. This study attempts to establish the effect of the permissive socio-cultural use of alcohol on the liver function of some alcohol drinkers. This would enable us to report the potential prevalence of liver dysfunction among the inhabitants of the Edo-Delta region, and to suggest measures that would help discourage the cultural attitudes that predispose individuals in this region to alcohol abuse and associated socio-medical consequences.

2. Materials and methods

Subjects: One hundred and fifty male alcohol drinkers who had been drinking for an average of 5 (2-8) years and had a daily consumption of 1.20 (0.8-1.6) g ethanol/kg body weight were randomly selected from twenty-seven communities in the Edo-Delta Region of Nigeria. Sixty sex- and age-matched non-alcohol-drinking individuals were used as the control subjects. Both the alcohol-drinking and non-alcohol-drinking subjects were in apparent good health.

The alcohol drinkers were divided into two classes: Class A, with an intake of 0.8-1.2 g ethanol/kg body weight per day, and Class B, with a daily consumption of 1.3-1.6 g ethanol/kg body weight. Each class was sub-divided into four groups depending on how long they had been drinking. The majority of the test subjects (alcohol drinkers) consume the locally distilled spirit "ogogoro", containing about 40-45% alcohol (ethanol). Their average daily intake of alcohol was estimated as previously described (Onyesom, & Atakuo, 1998) after interviews.

Collection of Blood Specimens: Fasting venous blood samples were collected from the subjects and put into plain, sterile bottles. The sera samples obtained after centrifuging at 1200 x g for 5 minutes at room temperature were stored frozen and analysed within 48h of collection.

3. Laboratory Analysis

Serum Bilirubin: The serum total and conjugated bilirubin were determined using the diazotised sulfanilic acid method (Noslin, 1960).

Enzyme Profile: Serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activity values were determined using a colorimetric method (Reitman, & Frankel, 1957). Assay of serum alkaline phosphatase (ALP) activity was by a colorimetric method (Bassey et al., 1946). The commercial kits containing the reagents used for these assays were supplied by Randox Laboratories Limited, Ardmore, United Kingdom.

Statistics: ANOVA was used to compare the data obtained and the significant difference was established at P<0.05.

4. Results

The data obtained are shown in Table 1. They indicate the changes in the diagnostic markers of liver function among alcohol-drinking and non-alcohol-drinking subjects in the Edo-Delta region of Nigeria. The results indicate that 20% of the alcohol drinkers had serum conjugated bilirubin levels above the upper limit of the reference (normal) range, while 60% had a serum unconjugated bilirubin level above such a limit. Analysis of the enzyme profile indicates that 90.0%, 93.4%, and 33.4% of the alcohol drinkers, respectively, had serum AST, ALT, and ALP activity values above the upper limit of the normal range.

The mean enzyme activity values for the alcohol drinkers were found to differ significantly at the 5% probability level when compared with the respective control mean values using analysis of variance (ANOVA).

5. Discussion

The liver is a complex organ which performs numerous metabolic, excretory, storage, and detoxifying functions and, because of the multiplicity and diversity of liver functions, there is no single laboratory test that yields all the necessary information regarding the functional state of the liver. In our study, biomarkers of the liver's excretory (serum bilirubin), synthetic (ALT), storage (AST), and secretory (ALP) abilities were selected, and these are common traditional markers of liver function in our environment.

The consumption of higher doses of alcohol (1.3-1.6 g/kg) over longer periods (8-15 years) was observed to significantly increase both total and unconjugated bilirubin concentrations in serum (Table 1).

An elevated serum bilirubin level may indicate impairment of the excretory function of the liver, excessive haemolysis, or obstruction of the biliary tract. Free bilirubin is normally conjugated in the liver and excreted in the bile, with a small amount of the conjugate being absorbed into the blood. An increased concentration of this conjugated (direct) bilirubin in the blood indicates a hepatic or biliary disorder, while a normal concentration of the conjugated amidst elevated total bilirubin suggests a haemolytic problem (Jewell et al., 1971). The trends of our data suggest a hepatobiliary disorder.

However, the results of the enzyme profile show that 25.00% and 42.86% of the Class A (0.8-1.2g ethanol/kg) and B (1.3-1.6g ethanol/kg) alcohol drinkers had increased ALP activity values (Table 1.0). Alkaline phosphatase (ALP) is located chiefly in the bones and in the liver, and is excreted in the bile. Most types of liver disease, particularly biliary obstruction, are accompanied by an increase in ALP activity in the blood. In general, the activity is greater in obstructive jaundice than in primary disease of the liver. The percentage fold increase suggests primary hepatocellular damage. The percentage fold increase in aspartate and alanine aminotransaminase (AST and ALT) activity values observed for both classes of alcohol drinkers were almost the same. AST and ALT exist in the tissues of many organs, and necrotic activity in these organs causes the release of abnormal quantities of such enzymes

into the blood (Annino, & Giose, 1976).

From the results obtained, over 85% of the alcohol drinkers have hepatobiliary dysfunction, which represents a high prevalence of liver disease among alcohol drinkers in the Edo-Delta region of Nigeria. This observation supports previous findings (Theal, & Scott, 1996; Onyesom et al., 2006). The biochemical basis of the hepatic effects of alcohol are complex and involve alterations in the level of co-factors such as NADH and disturbances in intermediary metabolism (Timbrell, 1989). The data revealed that the degree of hepatic damage and dysfunctions are related to both ethanol (alcohol) dosage and how long the individual has been drinking. Higher doses (1.3-1.6 g/kg) and a longer history of alcohol consumption (8-15yrs) carried greater health risks.

The majority of the ethnic groups in the Edo-Delta Region of Nigeria have permissive attitudes to alcohol consumption and this was strongly confirmed by the majority of the respondents who were orally interviewed during the survey. They noted that the permissive cultural attitude to alcohol consumption contributed to the problems of alcoholism in the region, and claimed that this has ruined the lives of some hitherto promising young people, especially men between the ages of 20 and 40. The evidence from our study indicates a high degree of liver dysfunction among alcohol drinkers, and as this dysfunction deteriorates as drinking persists, then hepatic damage and associated ill-health would become evident, which could result in early death. Thus, appropriate campaign strategies should be initiated in order to educate the lay public about the dangers inherent in their permissive socio-cultural behaviours that predispose individuals in the Edo-Delta Region of Nigeria to the abuse of alcohol. The government should establish programmes that would rehabilitate alcoholics and at-risk individuals.

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Tabulka 3 Some biochemical changes induced by alcohol consumption in humans

			Serum bilirubin		Maker enzymes			
			TB	CB	UB	AST	ALT	ALP
Class	Length of drinking history (yrs)	No of subjects	Mean SEM (µmol/L)	Mean SEM (µmol/L)	Mean SEM (µmol/L)	Mean SEM (IU/L)	Mean SEM (IU/L)	Mean SEM (IU/L)
A (0.8-1.2g) ethanol/kg	0-3	32	14.5±2.7	4.1±1.8*	10.4±1.9*	25.5±4.6*	24.7±4.0*	64.7±4.1
	4-7	28	14.8±2.1	3.5±1.7*	11.3±2.3*	42.8±5.1*	45.3±5.4*	70.3±5.2
	8-11	17	18.1±3.4	10.0±0.9	8.1±3.4	57.3±6.2*	44.8±5.2*	73.0±6.1*
	12-15	13	18.6±3.9	11.0±2.9	7.6±1.1	79.5±1.7*	78.0±4.5*	111.0±3.6*
B (1.3-1.6g) ethanol/kg	0-3	20	15.8±0.8	4.8±2.0*	11.2±2.0*	33.8±2.9*	57.0±6.0*	85.0±4.0*
	4-7	16	15.7±1.9	3.6±1.8*	12.1±2.5*	50.6±4.3*	57.5±4.8*	85.2±5.1*
	8-11	13	19.8±2.9*	12.2±3.1	8.6±1.7*	68.7±5.4*	47.0±4.2*	81.8±3.5*
	12-15	11	22.5±3.2*	8.8±2.7	13.7±2.3*	69.0±5.3*	45.7±5.0*	105.0±3.2*
Control Subjects		60	16.0±0.9	10.2±1.8	5.8±1.4	9.1±1.5	11.0±1.7	58.4±3.2
Normal Range			Up to 17.0	Up to 11.4	Up to 8.5	Up to 12.0	Up to 12.0	60-100

*Significantly different from control values (P<0.05)
TB - Serum total bilirubin
CB - Serum conjugated bilirubin
UB - Serum unconjugated bilirubin
AST = Aspartate aminotransferase.
ALT =Alanine aminotransferase.
ALP = Alkaline phosphatase.

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