Co-morbidity of Alcohol Dependence and Select Affective and Anxiety Disorders among Individuals of East Indian and African Ancestry in Trinidad and Tobago

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ABSTRACT

The present study sought to determine whether an association exists between alcohol dependence and select affective and anxiety disorders in patients presenting at substance abuse centres in Trinidad and Tobago (TT). The participants in this study were 143 alcohol dependents, of either East Indian ancestry (Indo-TT) or African ancestry (Afro-TT) and 109 controls matched by age, gender and ethnicity. A structured interview was used to gather information on demographics, psychiatric diagnoses and personal drinking and drug use. A blood sample was obtained and used to genotype for the presence of ADH and ALDH1 polymorphisms and serum levels of hepatic enzymes. Forty-one per cent of Indo-TT and 37% of Afro-TT with alcohol dependence had co-morbid major depressive disorders independent of alcohol and/or drug use. Thirty-nine per cent of Indo-TT and 37% of Afro-TT with alcohol dependence had co-morbid major depression induced by alcohol or drug use. The severity of depression was significantly associated with severity of alcohol dependence.

Neither major depression nor the severity of depressive episodes was associated with values of any liver function test or the presence of ALDH1*2 *or* ADH1C*2 *alleles. However, in participants of African descent elevated alanine transaminase ALT was associated (*p = *0.038) with not having substance-induced major depression. Co-morbidity of major depressive disorder with alcohol dependence is common in the two major ethnic groups in Trinidad and Tobago and appears to be as likely the consequence of drinking and/or drug use, as the cause. Clinicians should solicit a history of depression from patients with alcohol dependence.*

La Comorbilidad de la Dependencia del Alcohol y Trastornos Particulares de la Afectividad y de Ansiedad entre Individuos de Ascendencia Indooriental en Trinidad y Tobago

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RESUMEN

El presente estudio busca determinar si existe una asociación entre la dependencia del alcohol y trastornos particulares afectivos y de ansiedad en pacientes que acuden a centros de abuso de sustancia en Trinidad Tobago (TT). Los participantes en este estudio fueron 143 personas dependientes del alcohol, quienes eran bien de ascendencia indo-oriental (indo-trinitenses), o bien de ascendencia africana (afro-trinitenses), y 109 controles apareados por edad, género y etnicidad.

Se usó una entrevista estructurada a fin de recoger información sobre demografía, diagnóstico psiquiátrico, así como el consumo personal de drogas y alcohol. Una muestra de sangre fue obtenida y usada para un genotipado en busca de la presencia de polimorfismos ADH y ALDH1 así como de los niveles de sueros de las enzimas hepáticas. El cuarenta y uno por ciento de los indotrinitenses y el 37% de los afrotrinitenses con dependencia de alcohol presentaban serios trastornos depresivos

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comórbidos, independientes del alcohol y/o uso de drogas. La severidad de la depresión estuvo asociada de manera significativa con la severidad del uso del alcohol. Ni la depresión seria ni la severidad de los episodios depresivos estuvieron asociadas con los valores de ninguna de las pruebas del funcionamiento del hígado o la presencia de alelos de ALDH1*2 *o* ADH1C*2. *Sin embargo, en participantes de ascendencia africana, la elevada alanina transaminasa (ALT), estuvo asociada (*p = *0.038) con el no tener una depresión seria inducida por sustancia. La comorbilidad del trastorno depresivo severo con dependencia del alcohol, es común en los dos grupos étnicos principales de Trinidad y Tobago, y parece ser probablemente tanto la causa como la consecuencia de darse a la bebida y/o al uso de drogas. Los clínicos debían pedir a sus pacientes con dependencia de alcohol, una historia de su depresión.*

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INTRODUCTION

Substance dependence contributes significantly to social problems including crime, domestic violence, unemployment, as well as mental and physical health consequences. Caribbean research on substance dependence has generally focussed on the prevalence of the disorders (1–7), association with trauma (8), social consequences (9–13), patterns of substance usage (14–16), detection and treatment (17–23), gender issues (24, 25) and religious affiliation (26). Little has been published on the mental health consequences of substance dependence within the Caribbean (27–30).

Alcohol dependence is commonly associated with other psychiatric symptomatology, such as anxiety and affective disorders (31–39). Anxiety and affective symptoms occurring in an individual with alcohol dependence may be the result of a psychiatric disorder that pre-existed the alcoholism and thus could be one cause of drinking episodes if, for example, alcohol were consumed to "self-medicate" the psychiatric symptoms. Conversely, drinking episodes themselves may result in the development of anxiety or affective symptoms and disorders. Symptoms meeting diagnostic criteria for panic disorder, phobia, generalized anxiety disorder, major depressive disorder and manic states are common during intoxication, chronic drinking and alcohol withdrawal (38, 39). The fourth version of the Diagnostic and Statistical Manual (DSM-IV) of the American Psychiatric Association (40) refers to these disorders as "substance induced." Making the distinction between substance-induced disorders and those arising independent of substance use is not only important for understanding the aetiology of alcohol dependence but is also particularly relevant to clinical practice. Substance-induced disorders frequently dissipate with 2–4 weeks of abstinence and thus may only require supportive therapy whereas the presence of an independent disorder often requires therapeutic intervention (41).

There is little data on the rates of formally diagnosed anxiety and depression disorders and their co-morbidity with alcohol or drug dependence in people residing in the Caribbean. What data exists is limited to small select data sets and frequently has only been published in abstract form (15, 42). In the Caribbean, significant differences have been noted from island to island in alcohol dependence rates that have been attributed to environmental factors, as well as ethnic differences in the drinking culture. One study, on the island of Guadeloupe, reported mean consumption levels that classified Guadeloupeans as among the world's "foremost consumers of alcohol" (4). Higher rates of alcoholism in Caribbean areas with large populations of East Indians, like Trinidad and Guyana have been reported (43). In Jamaica, where the East Indian population is not large, a field study showed that both abstinence and excessive drinking were characteristics of East Indians (17). However, it is not known whether co-morbidity of alcohol and psychiatric disorders differs depending on ethnic groups in Caribbean nations.

Although large scale epidemiological studies have found high rates of co-morbidity of anxiety and affective disorders in individuals with alcohol dependence in the US (31, 32, 34, 37), as well as internationally (35, 36), it is generally not known if the elevated rates of affective and anxiety disorders arise independently or represent an increase in "substance-induced" psychiatric disorders. This is because most diagnostic instruments do not allow for making the distinction between those that are independent of substance (alcohol or drug) use and those that are substance-induced. Thus, the significant co-morbidity observed between alcohol dependence and anxiety and affective disorders reported in several large nationwide studies is most likely due to co-morbidity of both independent and substance induced disorders (38, 39). One diagnostic instrument that was specifically designed to determine whether an anxiety or affective disorder occurred outside the context of substance use or could be considered "substance- induced" is called the Semi-Structured Assessment for the Genetics of Alcoholism (SSAGA) (44, 45). Schuckit and colleagues (39), using this instrument, reported on a sample of 2713 alcoholics of mixed but predominantly Caucasian ethnicity and found that independent major depressions occurred in 8.3% of men and 17.8% of women, whereas substance-induced major depressions were found in 30.1% of men and 31.9% of women. These data suggest that the preponderance of major depression in alcoholism, at least in treatment samples, may be the result of and not the cause of alcohol dependence.

The present report is part of a larger study exploring risk factors for alcoholism among Indo- and Afro-Trini-

dadians (46-49). The purpose of the present set of analyses is to extend the studies of Schuckit and colleagues (38, 39) and Gilder and colleagues (50, 51) using the SSAGA to accomplish several objectives. The first aim of the study was to determine frequencies of select anxiety and affective disorders in East Indian and African patients and controls. The second aim of the study was to determine whether significant co-morbidity of these psychiatric disorders with alcohol dependence occurred in participants of either or both ethnicities. The third aim of the study was to determine whether the co-morbid psychiatric disorder diagnoses were independently occurring disorders or were substance-induced. The fourth aim of the study was to characterize further the relationship between depression and measures of risk for and severity of alcohol dependence including liver function tests and ADH and ALDH genotypes.

METHODS

Participants

This study was approved by the Ethics Committees of the Faculty of Medical Sciences at The University of the West Indies, the San Fernando General Hospital and the Ministry of Health for Caura Hospital, and the Institutional Review Board of The Scripps Research Institute. All participants gave written informed consent prior to inclusion in the study. Human material obtained in the course of this investigation was obtained and handled according to ethical standards currently in place in Trinidad and Tobago and the United States of America (USA). A total of 143 alcohol dependent individuals of either East Indian or African ancestry were included in the study. Ethnicity was classified as having three grandparents from one of the two ethnic groups. Patients with major medical problems that could have affected their drinking and were unrelated to alcohol dependence (cancer, severe heart or lung disease, diabetes *etc*) were excluded. Patients were recruited from admissions to the Substance Abuse Centres at Caura, San Fernando General and Scarborough Hospitals. Ninety-nine unrelated participants who were not alcohol dependent of both ethnic groups, were matched by age, gender and ethnicity to the alcohol dependent participants. These controls were recruited through fliers distributed in the communities and by word of mouth.

Psychiatric Assessment

All participants were interviewed by a qualified member of the psychiatric team using the Semi Structured Assessment for the Genetics of Alcoholism (SSAGA). This is an instrument designed to assess physical, psychological and social manifestations of alcoholism and related disorders. It has been previously validated by the Collaborative Group on the Genetics of Alcoholism in the USA (44, 45). Diagnoses of alcohol dependence, four anxiety disorders (panic disorder with or without agoraphobia, agoraphobia without panic, social phobia and obsessive-compulsive disorder), and three affective disorders (major depressive disorder, bipolar I disorder and dysthymic disorder) (DSM-III-R) were obtained using the SSAGA.

Based on the criteria of Schuckit and colleagues (38, 39) and Hesselbrock and colleagues (52), determinations were made in the case of each of the four anxiety disorders and three affective disorders whether they had occurred independently or in the context of substance use or abstinence. In each instance, the substance or substances responsible for the substance-induced anxiety or affective disorder was determined. An anxiety or affective disorder was considered to be substance-induced if: 1) the disorder occurred in the context of significant (in the case of alcohol, five or more drinks per day) and chronic (equal to or greater than one month) substance use; or 2) if the disorder occurred in the context of abstinence, the disorder started within one month of discontinuation of the substance following at least one month of significant and chronic use; or 3) if substance use was continuing, the disorder occurred in the context of significantly increased or decreased use (in the case of alcohol, by three or more drinks per day) of the substance after at least one month of significant and chronic use; and 4) the disorder was characteristic of intoxication with or withdrawal from the substance. An anxiety or affective disorder was considered independent of substance use if the disorder: 1) occurred without significant and chronic substance use; or 2) if the disorder occurred in the context of abstinence, the disorder had an onset later than one month after discontinuation of the substance, even if there had been significant and chronic use for one or more months prior to abstinence; or 3) the syndrome was not characteristic of intoxication or withdrawal from the substance.

In situations where the independent psychiatric disorder was likely due to a significant stressor in the participant's life: a medical illness, injury, a medication or toxin, or the death of someone close to the participant; diagnoses of adjustment reaction, a psychiatric disorder due to medical condition, a medication or toxin; and bereavement, respectively, were made. Adjustment reactions and post-partum states which met criteria for major depression episode were diagnosed as major depressive disorder. Because of the difficulties in accurately diagnosing hypomania, Bipolar II disorder (at least one lifetime major depressive episode and at least one lifetime hypomanic episode, but no lifetime manic episode) was included, for purposes of the analyses presented here, in the major depression disorder category. Adjustment reactions and psychiatric disorders due to a medical illness, the prescription use of a medication, or toxin were classified separately and not included in this analysis. Psychiatric disorders due to the nonprescription use of medication, such as benzodiazepines and opiates, were classified as substance induced. For each disorder, the percentage of participants who had a lifetime history of the independent and/or the substance-induced types of the same disorder was also estimated.

Biochemical evaluation

All subjects' blood specimens were tested for serum alanine and aspartate aminotransferase (ALT and AST respectively), alkaline phosphatase (ALP), lactate dehydrogenase (LDH) and gamma-glutamyl transpeptidase (GGT) levels as well as for the presence of HIV, hepatitis B surface antigen and anti-hepatitis C virus antibody. DNA was isolated from leukocytes and ADH1B, ADH1C and ALDH1A polymorphisms determined at Indiana University. The relevant portions of the loci were amplified using the polymerase chain reaction followed by hybridization with allele specific radio-labelled oligonucleotide probes (53).

Data analyses

Comparative quantitative analysis between the alcohol-dependent subjects and the control subjects in the two ethnic groups was performed using ANOVA, while analysis of categorical variables was performed using chi-square (X^2) test or Fisher's exact test depending on cell size. In these analyses, a p-value < 0.05 was considered statistically significant. In the quantitative analyses, results were expressed as mean ± SE. In addition, depression disorders, alcohol induced anxiety and depression symptoms (both intoxication and withdrawal symptoms) and severity of depression were each examined for association with severity of alcohol dependence, indices of liver inflammation, and variations in alcohol metabolizing enzymes using SPSS in multiple logistic regression analyses. The p entry criterion of 0.15 and p removal criterion of 0.20 were used in a forward stepwise likelihood ratio approach following Hosmer and Lemeshow (54). Significance was set at $p < 0.05$ in the final logistic regression model. Analyses were performed in the East Indian and African ancestry patient samples separately.

RESULTS

Participant demographics

One hundred and sixty-five East Indians and 87 Africans participated in this study. Of these, 100 East Indians and 43 Africans were in substance abuse treatment and diagnosed with DSM-III-R alcohol dependence (patients), and 65 East Indians and 44 Africans were not in substance abuse treatment and were not diagnosed with alcohol dependence (controls). Table 1 compares the demographic and clinical characteristics of the East Indian and African patients. East Indian patients did not significantly differ from African patients on age, education, marital status and economic status but were less likely to be male ($p = 0.039$) and employed ($p < 0.001$). East Indian patients, compared with East Indian controls, were less likely to be married ($p < 0.001$) and employed ($p < 0.001$). African patients, compared with African controls, were less likely to be married ($p = 0.005$) and to be employed ($p < 0.001$). These comparisons of patients with their same ethnicity controls are not shown in the Table. Of the entire sample, only one participant was positive for HIV, one was positive for Hepatitis B and none positive for Hepatitis C.

Table 1: Demographic characteristics comparing alcohol-dependent Indo-Trinidadians to alcohol-dependent Afro-Trinidadians

Variable	Indo-Trinidadians (n = 100)		Afro-Trinidadians (n = 43)		*p*-value
	Mean	**SE**	**Mean**	**SE**	
Age	44.1	0.7	45.4	1.2	0.364
Years of education	9.5	0.4	9.9	0.5	0.518
	n	**%**	**n**	**%**	
Gender					
Male	86	86.0	42	97.7	0.039*
Female	14	14.0	1	2.3	
Employed					
No	41	41.0	5	11.6	< 0.001*
Yes	59	59.0	38	88.4	
Economic status					
< 20K	91	94.8	42	97.7	0.666
? 20K	5	5.2	1	2.3	
Married					
No	63	63.0	30	69.8	0.567
Yes	37	37.0	13	30.2	

*$p < .05$

The alcohol-dependent Indo-Trinidadian group vs. the alcohol-dependent Afro-Trinidadian group was compared using Fisher's Exact Test for dichotomous variables and ANOVA for continuous variables.

Prevalence of psychiatric disorders

The first aim of the study was to determine frequencies of select anxiety and affective disorders in East Indian and African patients and controls. Table 2 shows the rates of independent anxiety and affective disorders in the East Indian and African patients and controls. The most common of the independent anxiety and affective disorders was major depressive disorder. Forty-one per cent of East Indian patients (compared to 3% of their controls) and 37% of African patients (compared to 2% of their controls) had lifetime independent major depressive disorder. The only other independent anxiety and affective disorders diagnosed in patients or controls of either ethnicity were social phobia, obsessive-compulsive and dysthymic disorders. None of these disorders occurred at a frequency greater than 3% in either group of patients or their controls. Childhood conduct disorder occurred in 3% of East Indian patients and in 7% of African patients. Adult antisocial personality disorder occurred in 5% of East Indian patients and in 0% of African patients. Neither childhood conduct nor adult antisocial personality disorder occurred in either control group.

Co-morbidity of psychiatric disorders

The second aim of the study was to determine whether significant co-morbidity of independent psychiatric disorders with alcohol dependence occurred in participants of either or both ethnicities. In East Indian ancestry participants, the

Table 2: Co-morbidity of independent psychiatric disorders in the alcohol dependent group *vs*. the non-alcohol dependent group in the Indo-Trinidadian and Afro-Trinidadian samples.

	Indo-Trinidadian (n = 165)			Afro-Trinidadian (n = 87)		
Psychiatric disorder	**Alcohol dependent (n = 100) (n, %)**	**Non-alcohol dependent (n = 65) (n, %)**	***p*-value**	**Alcohol dependent (n = 43) (n, %)**	**Non-alcohol dependent (n = 44) (n, %)**	***p*-value**
Panic	0, 0	0, 0	N/A	0, 0	0, 0	N/A
Social phobia	0, 0	1, 2	0.394	0, 0	0, 0	N/A
Agoraphobia	0, 0	0, 0	N/A	0, 0	0, 0	N/A
Obsessive compulsive	3, 3	0, 0	0.279	0, 0	0, 0	N/A
Major depressive	41, 41	2, 3	< 0.001*	16, 37	1, 2	< 0.001*
Bipolar I	0, 0	0, 0	N/A	0, 0	0, 0	N/A
Bipolar II	0, 0	0, 0	N/A	0, 0	0, 0	N/A
Dysthymia	2, 2	0, 0	0.520	0, 0	0, 0	N/A
Any anxiety	3, 3	1, 2	1.000	0, 0	0, 0	N/A
Any affective	43, 43	2, 3	< 0.001*	16, 37	1, 2	< 0.001*
Any anxiety or affective	45, 45	2, 3	< 0.001*	16, 37	1, 2	< 0.001*

* $p < 0.05$

The alcohol dependent group vs. the non-alcohol dependent group was compared within each ethnicity separately using Fisher's Exact Test for dichotomous variables.

odds ratio (OR) of having independent major depressive disorder in the alcohol dependent compared to the non-alcohol dependent group was 21.89 (95% Confidence Interval (CI): 5.07, 94.55, $p < 0.001$). In African ancestry participants the OR was 25.48 (95% CI: 3.19, 200.32, $p < 0.001$). Of the independent psychiatric disorders, only major depressive disorder showed significant co-morbidity with alcohol dependence. In several cases, the other psychiatric disorders occurred at frequencies that were too low to permit valid co-morbidity calculations in either ethnicity. The significance of the co-morbidity calculations using Fisher's exact test for each ethnicity separately is shown in Table 2.

Substance-induced disorders

The third aim of the study was to determine the rates and impact on co-morbidity with alcohol dependence of substance induced psychiatric disorders. Substance-induced psychiatric disorders meet the same criteria as psychiatric disorders, except that substance-induced psychiatric disorders are judged to be caused by intoxication or withdrawal from alcohol or drugs. Substance-induced major depression occurred in 39% of East Indian, 37% of African patients and in 0% of controls of both ethnicities. The only other substance-induced psychiatric disorder in patients or controls was one substance-induced dysthymic disorder in an African ancestry patient who also had substance-induced major depressive disorder.

In acute inpatient settings, it is often difficult if not impossible to distinguish independent psychiatric disorders from substance-induced psychiatric disorders. Since the rates of independent major depression and substance-induced major depression were substantial in patients of both ethnicities, we also examined frequencies and co-morbidities of independent major depression and substance-induced major depression considered as a single clinical syndrome, termed "total major depression." The rate of total major depressive disorder in East Indian patients was 56% (3% in their controls; OR = 40.9, 95% CI = 9.29, 172.99, $p < 0.001$), and the rate in African patients was 42% (2% in their controls; OR = 30.96, 95% CI = 3.89, 246.13, $p < 0.001$).

Depression and measures of risk and severity of alcohol dependence

The fourth aim of the study was to characterize further the relationship between depression and measures of risk for and severity of alcohol dependence. To undertake this aim, we tested for associations between depression disorders, alcohol induced anxiety and depression symptoms (both intoxication and withdrawal symptoms) and severity of depression on the one hand with severity of alcohol dependence, indices of liver inflammation and variations in alcohol metabolizing enzymes on the other. We tested for these associations in both the East Indian and African ancestry patient samples using multiple logistic regressions. The independent and outcome variables used in these regression analyses are shown in Table 3. Each outcome variable listed in the left column of Table 3 was tested for association with all the independent variables listed in the right hand column of the Table in a separate regression analysis.

Self-reported alcohol induced depression ($p < 0.001$), anxiety ($p < 0.001$), cognitive impairment ($p < 0.001$), and paranoia ($p = 0.004$), alcohol withdrawal tremors ($p < 0.008$) and alcohol withdrawal anxiety and depression ($p < 0.008$), and severity of most severe lifetime depression episodes ($p =$

Table 3: Variables used to test the association of depression disorders, alcohol-induced depression symptoms, and depression severity with severity of alcohol dependence, variation in liver function, and alcohol-metabolizing enzymes using multiple logistic regressions

Outcome variables	Independent variables
Major depressive disorder	Severity of alcohol dependence
Alcohol-induced major depressive disorder	ALP
Alcohol-induced depression	AST
Alcohol-induced anxiety	ALT
Alcohol-induced cognitive impairment	GGT
Alcohol-induced paranoia	LDH
Alcohol-induced hallucinations	ADH1C*2 (hetero- or homozygous)
Alcohol-induced withdrawal shakes	ADH1B*3 (hetero- or homozygous)
Alcohol-induced anxiety or depression	ALDH1A*2 (hetero- or homozygous)
Incapacitation from depression	
Suicidal ideation	
Suicide attempt	
Depression severity	

0.040) were significantly associated with severity of alcohol dependence in East Indian patients. Self-reported alcohol induced depression (p = 0.025), anxiety (p = 0.015), cognitive impairment (p = 0.006), paranoia (p = 0.045), and hallucinations (p = 0.046), and alcohol withdrawal anxiety and depression (p = 0.040) were significantly associated with severity of alcohol dependence in African patients. Substance-induced major depressive disorder and incapacitation from depression were not significantly associated with severity of alcohol dependence in either patient group alone, but when both groups were combined, substance-induced major depressive disorder (p = 0.036) and incapacitation (p = 0.009) were significantly associated with severity of alcohol dependence. Severity of the most severe lifetime depression episode was significantly associated with severity of alcohol dependence in both the Indian sample (p = 0.040) and the combined sample (p = 0.005) though not in the African sample alone. Thus, substance-induced major depression, alcohol induced depression symptoms, incapacitation from depression and severity of depression episodes were all associated with severity of alcohol dependence.

In contrast, independent major depressive disorder (which was not substance-induced) was not associated with severity of alcohol dependence. A history of suicidal ideation and suicide attempt were not associated with alcohol dependence severity in either patient group alone or in the combined patient group.

None of the outcome variables, including either independent major depression and substance-induced major depression, alcohol induced anxiety and depression symptoms, incapacitation from depression, severity of depression, suicidal ideation and suicide attempt, was associated with any liver function test or alcohol metabolizing enzyme allele with the exception that elevated ALT was associated (p = 0.038) with not having substance-induced major depression in the African patient sample.

DISCUSSION

Among those participants in the National Co-morbidity Survey (in the USA) with a lifetime alcohol abuse or dependence diagnosis, 52% of the respondents were also found to have a lifetime mental illness. Additionally, among participants with a lifetime history of illicit drug abuse or dependence in that survey, 59% also had a lifetime mental disorder (55). Hesselbrock and colleagues (56), in a study looking at 321 participants recruited from three inpatient alcoholism treatment centres in the greater Hartford, Connecticut area, found that anti-social personality disorder (49%) and substance use disorder (45%) were common psychopathologies among male alcoholics and major depression (52%) and phobia (44%) were common among female alcoholics. Similar results were reported by Powell *et al.* (57) in their assessment of 565 inpatient alcoholics in which they found that the most common additional syndrome was affective disorder followed by anti-social personality disorder. In another study, Ross and colleagues (58), in a survey of 501 patients seeking assistance with alcohol and other drug problems at an addiction research and treatment facility found that 78% had Diagnostic Interview Schedule (DIS) lifetime psychiatric disorder in addition to substance use. The most common lifetime psychiatry disorders were antisocial personality disorder (46.9%), phobias (33.7%), psychosexual dysfunction (34.5%) and major depression (24.3%). Of these patients, 68% reported that it was their drug abuse that was causing them the most problems at the time of admission.

Alcoholism has also been associated with co-morbid anxiety and affective disorders. In a group of patients diagnosed with anxiety neuroses (diagnosed according to DSM-III), estimates of alcohol problems have ranged from 16% to 25% (59). In studies looking at patients receiving treatment for alcohol problems, estimates for co-morbid anxiety disorders range from 22.6% to 68.7% (60). Gratzer and colleagues (61), in a study of 7195 individuals in Ontario, aged

15–64 years, used the Composite International Diagnostic Interview (CIDI). They found that there was a significantly higher rate of alcohol abuse/dependence in the co-morbid depressed/anxiety group than the "pure" anxiety disorder group. The relative risk of alcohol abuse/dependence was 3.8 in the anxiety group *versus* controls and 4.39 in the depressed group as compared to the controls.

Few studies have focussed on the co-morbidity of anxiety and affective disorders in the Caribbean. Although there were several studies of alcohol dependence on the islands of Trinidad and Tobago in the past (17, 62), these studies focussed mainly on drinking behaviour and patterns of substance use among different ethnic groups (17, 63).

An important finding of the present study is the lack of ethnic difference in the rates and co-morbidity of major depression with alcohol dependence. The high incidence and significant co-morbidity of major depressive disorder with alcohol dependence in both ethnicities is similar to what has been reported for inpatient alcoholics of other ethnicities and nationalities (39, 56, 57). In contrast, low rates of anxiety disorders were noted in both inpatient samples in this study. These appear to be lower than previous reports of other inpatient samples (59, 60). These differences in rates and co-morbidity of anxiety disorders may reflect the small sample size and/or the largely male composition of both ethnicity samples in the present study or may represent a true ethnic difference between Indo-Trinidadians and Afro-Trinidadians and ethnicities represented in previous studies.

Ethnic differences in co-morbidity of alcohol and affective/anxiety disorders have been reported in community samples. Gilder and colleagues, studying a community sample of Southwest California Indians (50) and young adult Mexican Americans (51) found that the Indian sample had less and the Mexican sample more major depression associated with alcohol dependence. Since these are community samples, they are not directly comparable to the inpatient samples in the present study, but suggest the possibility of true ethnic differences in co-morbidity.

The high rates of substance-induced major depression in both the Indian and the African ancestry alcohol dependent patients in this study are consistent with the high rates of depression in other treatment samples and are consistent with high rates of substance-induced major depression in the COGA study (39). Unlike the COGA study, the present study did not find high rates of other substance-induced psychiatric disorders. Taken together, these data suggest that co-morbidity of major depressive disorder with alcohol dependence, is common in the two major ethnic groups in Trinidad and Tobago and appears to be due to the consequence of drinking and/or drug use.

The lack of association of depressive disorders, depression symptoms and depression severity, with either the indices of liver inflammation or the alcohol metabolizing alleles, suggests that liver inflammation does not play a role in substance-induced depression and that the alleles, which modulate risk for alcohol dependence (46, 48, 49) do not modulate risk for depressive illness or depressive symptoms in either Indian or African ancestry alcohol dependent patients.

It is important to consider some of this study's limitations. First, a modest, non-randomly selected sample was assessed; thus, the findings cannot be generalized to all Trinidadian alcohol dependent or non-alcohol dependent individuals. A larger sample size will be required to understand fully the relationship between drinking patterns and co-morbid psychiatric disorders. In addition, women were under represented in the sample. Despite these limitations, this report represents an important first step in an ongoing investigation to determine risk and protective factors associated with the development of substance use disorders in these ethnic groups in Trinidad.

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