ORIGINAL ARTICLE

Do SADQ and AUDIT identify independent impacts of alcohol abuse - clinical and biochemical markers respectively?

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ABSTRACT

Background and Objectives: We have analyzed extant data to see if Alcohol Use Disorder Identification Test (AUDIT) and Severity of Alcohol Dependence Questionnaire (SADQ) assess overlapping aspects of alcoholism, and how they relate to lab measures of alcoholism.
Materials and Methods: Consecutive male patients between 20 and 50 years were recruited from varied departments of a general hospital. AUDIT and SADQ, as well as liver function tests, were part of the data obtained.
Results: Despite, a significant correlation between total scores of SADQ and AUDIT ($\rho = 0.188$, $P < 0.021$) and some of their sub-scores. SADQ scores alone were significantly correlating with clinical variables of alcoholism such as family history and age of onset; AUDIT did not. On the other hand, AUDIT total scores correlated with total and conjugated bilirubin, while SADQ did not.
Interpretation and Conclusion: Our data suggests that the two scales, AUDIT and SADQ may be tapping into two different outcomes of increased alcohol use namely clinical and biochemical markers, respectively. SADQ could be useful in studies looking at withdrawal related severity and clinical aspects of alcoholism; while AUDIT could be more suitable for studies looking at alcoholism-related medical morbidity. This needs to be confirmed in larger unselected samples from different community and clinical settings.

Key words: Age of onset, Alcohol Use Disorder Identification Test, behavioral, biomarkers, family history of alcoholism, liver function tests, Severity of Alcohol Dependence Questionnaire, severity of alcoholism

INTRODUCTION

In varied contexts, the assessment of alcohol misuse needs screening efforts, and in those positive, for subsequent evaluation of severity. Screening is necessary to identify subjects at risk particularly in the early phase of drinking. It helps in identifying both hazardous and harmful users. In general, the screening instruments are sensitive to low-level misuse of a substance, suitable for detecting potential abuse, and dependence but may not necessarily be a measure of severity by themselves. There have been many screening instruments available to screen problem drinkers. In India Alcohol Use Disorder Identification Test (AUDIT),[1] CAGE,[2] and Michigan Alcoholism Screening Test (MAST)[3] have been commonly used.[4-7]

The severity instruments are useful in subjects with significant misuse and also help monitor treatment outcomes, but may not be sensitive to low-level use. Researchers in India also have studied the severity of alcoholism in different ways. These studies use either an

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Interview Format or a Questionnaire method. The interview formats include Alcohol section of the Schedules for Clinical Assessment in Neuropsychiatry[8] and Addiction Severity Index.[9] The questionnaire method has depended on Severity of Alcohol Dependence Data (SADD)[5] and Severity of Alcohol Dependence Questionnaire (SADQ).[7,10]

As mentioned above, AUDIT is generally adopted as a screening instrument. It was primarily designed to identify people with hazardous and harmful consumption before the onset of physical dependence or psychological problems. It is 10 items instrument derived from a 150 item interview schedule. After a detailed statistical analysis and face validity, 10 items were selected which assess three conceptual domains that include alcohol consumption (items 1–3), dependence (items 4–6), and alcohol-related problems (items 7–10). It has been validated in six countries, standardized cross-nationally, and has cross-cultural applicability.[1] It is the only instrument designed to be used internationally, focuses on recent use of alcohol and consistent with the International Classification of Disease tenth revision's (ICD-10) definition of harmful use and dependence pattern. It has been used by Indian researchers,[11] and has been validated in the urban community in the North India.[12] There are many studies, which have used AUDIT in the general population, family practice and primary care centers; however, there are only a few studies in clinical groups where the AUDIT scores are high.[13] As can be expected, higher scores are associated with the alcohol dependence syndrome. W.H.O has also divided the AUDIT scores into four zones (0–7, 8–15, 16–19, 20–40) and suggest that higher levels such as 20–40 require referral to specialist center for diagnostic evaluation and further management.[1,14] However, few studies have demonstrated that AUDIT can be used as a severity scale beyond its role as a screening instrument. Daeppen *et al.*[15] studied the utility of AUDIT as a severity measure after incorporating it with a health risk screening questionnaire. They found that it was able to identify at-risk drinkers and alcohol-dependent individuals in primary care settings. Donovan *et al.*[16] demonstrated that AUDIT can be used as a brief and a sensitive index of severity of dependence in alcohol-dependent individuals in outpatient treatment settings. Rubinsky *et al.*[17] using a secondary data analysis of a cross-sectional study of adult family medicine outpatients found that men in the AUDIT severity zones of 5–10, 11–14, and 15–40 was able to predict past-year of alcohol dependence ranging from 18% to 87% and three-fourth of those in the highest zone (15–40) met the standardized interview criteria for the past-year alcohol dependence. Gache *et al.*[18] found that AUDIT was able to discriminate dependent patients (with AUDIT ≥13 for males, sensitivity 70.1%, specificity 95.2%, positive predictive value (PPV) 85.7%, negative predictive value (NPV) 94.7%, and for females sensitivity 94.7%, specificity 98.2%, PPV 100%, NPV 99.8%); and hazardous drinkers (with AUDIT ≥7,

for males sensitivity 83.5%, specificity 79.9%, PPV 55.0%, NPV 82.7%; and with AUDIT ≥6 for females, sensitivity 81.2%, specificity 93.7%, PPV 64.0%, NPV 72.0%) compared to MAST and CAGE in a primary care settings. An epidemiological survey by Guo *et al.*[19] in the Tibetan population concluded that AUDIT performed better as a screening instrument for alcohol abuse than for alcohol dependence.

SADQ is a 20 item questionnaire based on the concept of alcohol dependence syndrome formulated by Edwards and Gross.[20] According to them, Alcohol dependence is a unitary syndrome centered on the "drive" to consume alcohol, and this "drive" is focused upon the need to drink to avoid or alleviate alcohol withdrawal. The original SADQ is divided into five sections corresponding to (i) physical withdrawal symptoms, (ii) affective symptoms of withdrawal, (iii) craving and withdrawal relief drinking, (iv) typical daily consumption and (v) reinstatement of withdrawal symptoms after a period of abstinence. It has been validated in inpatient, outpatient, and community settings.[21]

Previous studies have used various biological parameters for screening and evaluating the severity of alcoholism. Such measures include mean corpuscular volume, aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyltransferase (GGT), and uric acid. Studies have argued that severity and screening instruments are better than biological markers alone and are lesser expensive.[22,23] The role of biochemical measures is in the form of external validation. Many studies have tried a combination of questionnaires and biochemical markers. In a study by Dolman and Hawkes,[24] they found that using a combination of AUDIT, AST, and GGT increased the sensitivity to 70.6%, specificity to 98.8%, PPV to 54.5%, and NPV to 99.4% compared to other combinations. AUDIT and SADQ were used as part of a recent study,[7] in a variety of inpatients who reported using alcohol heavily. In this report, we have attempted to address the issue of whether AUDIT and SADQ assess overlapping or different aspects of alcohol dependence. Primarily, we have explored AUDIT as a severity measure in the Indian context by studying its association with SADQ. We have also compared the nature of the relationships of each of the measures with independent clinical and biochemical markers related to alcohol use.

MATERIALS AND METHODS

Materials
Male patients between the age group of 20 and 50 years who got admitted for alcohol-related problems in medical, surgical, orthopaedics and psychiatric wards in a tertiary care center were interviewed. They were recruited consecutively for this study over a period of 14 months. Subjects who scored <8 on CIWA-AD[25] (i.e., no significant withdrawal symptoms) were administered AUDIT and only those subjects scoring more

than eight on AUDIT were included in the study. The details of the study are available in a previous published study.[7] The severity of alcoholism was primarily obtained using SADQ. We obtained the information of the liver function tests (LFTs) after the completion of these assessments. This study was approved by the Institutional Ethics Review Board.

Statistical analysis

The variables were not distributed normally, hence we used nonparametric methods. Spearman's rank-order correlation was used for assessing the relationship between the scales and clinical variables. The null hypothesis was set to be rejected at a $P < 0.05$. Statistical analysis was done using Statistical analysis was done using SPSS for Windows (SPSS software package, version 15, SPSS Inc., Chicago, Illinois). Bonferroni corrections were applied to accommodate multiple correlations.

RESULTS

Totally, 295 patients admitted with alcohol-related problems during the study period were clinically in a position to be interviewed. Totally, 15 (2.22%) of these patients were females, 20 patients (2.97%) refused to participate in the study. A total of 12 patients (1.78%) were excluded from the study due to sub-optimal informants. A total of 48 patients (7.13%) had an AUDIT score of <8 and thus 200 subjects qualified for the final study. We were able to access the complete LFT reports for 149 of these subjects.

Table 1 gives the summary of the severity scales and LFTs. There was a significant, yet modest correlation between total scores of SADQ and AUDIT ($\rho = 0.188$, $P < 0.021$, $n = 149$). There is a significant correlation between the total SADQ and it's sub-scores. Similarly, AUDIT total scores and its sub-scores correlated significantly. Table 2 summarizes the correlation between the SADQ and AUDIT total scores with the sub-scores of the other. The total SADQ score correlated significantly with the alcohol-related problem sub-score of AUDIT. The AUDIT total score correlated with withdrawal relief drinking and rapidity of reinstatement of drinking sub-scores of SADQ.

The total severity scores of SADQ and some of the sub-scores were significantly different between subjects with a different family history of alcoholism and different ages of onset [Table 3]. However, there was no difference when the AUDIT scores were divided based on family history of alcoholism or ages of onset using nonparametric analysis. Conversely, SADQ scores were significantly correlating with age of first use of alcohol, age of onset of problem drinking, age of onset of dependence, and family history density; also a trend toward significance was seen with duration of dependence. However, there was no correlation between these clinical variables of alcoholism and AUDIT [Table 4].

Table 1: Summary of total and sub-scores of severity scales and LFTs

Scales	Sub-scores	Median (25th-75th percentiles)
SADQ	Physical withdrawal	9 (6, 9)
	Affective withdrawal	7 (0.5, 12)
	Withdrawal relief drinking	12 (11, 12)
	Alcohol consumption	7 (6, 9)
	Rapidity of reinstatement of drinking	12 (8, 12)
	Total scores	44 (35.5, 51)
AUDIT	Consumption score	12 (12, 12)
	Dependence score	12 (11, 12)
	Alcohol-related problem score	16 (16, 16)
	Total score	40 (37, 40)
LFT	TB	1 (0.6, 1.9)
	CB	0.5 (0.4, 0.8)
	AST	56 (34, 133)
	ALT	56 (39, 85)
	AST/ALT ratio	1.09 (0.75, 1.46)
	GGT	122 (53.5, 295)

SADQ – Severity of Alcohol Dependence Questionnaire; AUDIT – Alcohol Use Disorder Identification test; LFT – Liver function test; TB – Total bilirubin; CB – Conjugated bilirubin; AST – Aspartate aminotransferase; ALT – Alanine aminotransferase; GGT – Gamma-glutamyltransferase

Table 2: Correlation of total scores and sub-scores of SADQ and AUDIT (n=149)

Scales	Sub-scores	Spearman's Total AUDIT (ρ)	P
SADQ	Physical withdrawal	0.122	0.137
	Affective withdrawal	0.094	0.253
	Withdrawal relief drinking	0.360	0.001
	Alcohol consumption	−0.039	0.633
	Rapidity of reinstatement of drinking	0.269	0.001
		Total SADQ (ρ)	P
AUDIT	Consumption score	0.142	0.084
	Dependence score	0.103	0.209
	Alcohol related problem score	0.228	0.005

Spearman's rank-order correlation. SADQ – Severity of Alcohol Dependence Questionnaire; AUDIT – Alcohol Use Disorder Identification Test

There was a significant difference in the total bilirubin (TB) (0.9 vs. 2.15, $P < 0.001$), conjugated bilirubin (CB) (0.5 vs. 1.40, $P < 0.001$), AST (54 vs. 69, $P = 0.014$), and AST/ALT ratio (0.92 vs. 1.27, $P < 0.001$) between the psychiatry and nonpsychiatry ward using Mann–Whitney U-test. However, there was no significant difference between the ward on both the scales.

There was a significant correlation between total AUDIT scores and TB ($\rho = 0.224$, $P = 0.007$, $n = 145$) and the CB ($\rho = 0.176$, $P = 0.034$, $n = 145$). Among the sub-scores of AUDIT, the consumption sub-score correlated with AST ($\rho = 0.169$, $P = 0.040$, $n = 145$); the alcohol related problem score correlated with AST/ALT ratio ($\rho = 0.192$, $P = 0.02$, $n = 145$). The total SADQ scores correlated only with ALT ($\rho = −0.166$, $P = 0.044$). The Spearman's rank-order correlation showed that the withdrawal relief drinking sub-score (of SADQ) correlated with TB ($\rho = 0.171$, $P = 0.039$, $n = 145$), and AST/ALT ratio ($\rho = 0.225$, $P = 0.006$,

Table 3: Difference in severity scores and biochemical markers in different family history and ages of onset

Severity scales	Family history of alcoholism		P	Age of onset of starting		P
	Positive	Negative		Early	Late	
Physical withdrawal	9 (6, 11)	8 (6, 9)	0.045	9 (7, 11)	8 (6, 9)	0.005
Affective withdrawal	8 (4, 12)	6 (0, 9)	0.106	8 (4, 12)	6 (0, 10)	0.066
Withdrawal relief drinking	12 (11, 12)	12 (9, 12)	0.126	12 (12, 12)	12 (9, 12)	0.309
Alcohol consumption	8 (6, 9)	6 (6, 9)	0.128	8 (6, 9)	6 (6, 9)	0.010
Rapidity of reinstatement	12 (10, 12)	9 (6, 12)	0.001	12 (9, 12)	10 (6, 12)	0.005
Total SADQ scores	47 (37, 53)	39 (32,50)	0.003	47 (39, 53)	39 (33, 49)	0.001
Consumption score	12 (11, 12)	12 (10, 12)	0.583	12 (11, 12)	12 (12, 11)	0.820
Dependence score	12 (11, 12)	12 (10, 12)	0.892	12 (11, 12)	12 (11, 12)	0.963
Alcohol-related problem score	16 (16, 16)	16 (16, 16)	0.621	16 (16, 16)	16 (16, 16)	0.359
Total AUDIT score	40 (38, 40)	39 (36, 40)	0.349	40 (37, 40)	40 (37, 40)	0.909
TB	1 (0.6, 1.8)	1.05 (0.7, 1.9)	0.622	1 (0.6, 2.10)	1 (0.7, 1.6)	0.846
CB	0.50 (0.3, 0.7)	0.50 (0.4, 0.9)	0.380	0.50 (0.35,0.9)	0.50 (0.4, 0.7)	0.883
AST	58 (34, 125)	55.50 (35, 133)	0.751	65 (32, 144)	54 (37, 103)	0.653
ALT	49 (39, 85)	60 (40, 82)	0.651	56 (39, 88)	54 (39, 78)	0.786
AST/ALT Ratio	1.07 (0.75, 1.41)	1.10 (0.76, 1.46)	0.751	1.09 (0.73, 1.55)	1.08 (0.80, 1.26)	0.935
GGT	100 (45, 264)	150 (72, 354)	0.041	122.50 (50, 271)	120 (57, 315)	0.807

Median and 25–75 percentiles given, Mann–Whitney U-test used. TB – Total bilirubin; CB – Conjugated bilirubin; AST – Aspartate aminotransferase; ALT – Alanine aminotransferase; GGT – Gamma-glutamyltransferase; SADQ – Severity of Alcohol Dependence Questionnaire; AUDIT – Alcohol Use Disorder Identification Test

Table 4: Correlation of severity scales and clinical variables of alcoholism (n=149)

Clinical variables	Spearman's rank-order correlation			
	SADQ		AUDIT	
	ρ	P	ρ	P
Age of starting	−0.28	0.001	0.005	0.955
Age of onset of problem drinking	−0.31	0.001	0.042	0.609
Age of onset of dependence	−0.35	0.001	−0.077	0.351
Duration of problem drinking	0.13	0.126	−0.028	0.731
Duration of dependence	0.15	0.061	0.095	0.249
Family history density	0.28	0.001	0.102	0.216

Spearman's rank-order correlation; SADQ – Severity of Alcohol Dependence Questionnaire; AUDIT – Alcohol Use Disorder Identification Test

$n = 145$). The rapidity of reinstatement sub-score (of SADQ) correlated with AST/ALT ratio ($\rho = 0.166$, $P = 0.045$, $n = 145$).

DISCUSSION

The main aim of the study was to explore if AUDIT shows convergence with measures of severity of alcoholism. The other aim was to see if the two scales were assessing overlapping or different aspects of alcohol dependence. The total scores and some sub-scores of both the scales correlated with each other. The total score of AUDIT was correlating only with withdrawal relief drinking and rapidity of reinstatement of drinking and did not correlate with the other sub-scores of SADQ. There was a significant correlation between total scores of AUDIT and SADQ ($\rho = 0.188$, $P < 0.021$, $n = 149$). However, the strength of association was lesser compared to studies that report the relationship between two sets of scales in this field, such as SADD versus Alcohol Dependence Scale ($r = 0.61$, $P < 0.01$). [26] Furthermore, our findings suggest that the two scales were assessing different aspects of dependence. A 20 year old conclusion that measurement of severity of alcoholism

is not a fully resolved issue may still be relevant.[27] SADQ is based on the syndrome formulated by Edwards and Gross[20] and assessed the "drive" to consume alcohol and is focused on the need to drink to avoid or alleviate alcohol withdrawal.[28] It focuses on the withdrawal aspects of alcoholism, the withdrawal symptoms and the need to overcome withdrawal symptoms. However, AUDIT is a more universal scale since it incorporates quantity, frequency, control, withdrawal symptoms, alcohol-related problems, and psychological feelings of annoyance and guilt. In our study too, it was evident that the correlation according to the total and sub-scores between the two scales were very limited.

As reported by us earlier, SADQ scores were significantly different between positive and negative family history and early and late onset of alcoholism[7] while AUDIT was not similarly discriminating. One author has suggested that AUDIT may be used as a brief and sensitive instrument for assessing the severity of dependence in a clinical setting among individuals diagnosed to have alcohol dependence syndrome, thus extending it's utility beyond screening process. In fact, the same authors have summarized that there is little information concerning the clinical usefulness of scores that fall in the problematic alcohol use (cut-off score of >8), most of the studies are done on community samples, very few on subjects with established dependence and only few studies have validated AUDIT concurrently with measures of problem severity.[26] Based on the above findings, we feel that AUDIT does not demonstrate the ability to detect certain clinical aspects of alcoholism. However, AUDIT may still be useful in studies where the focus is on the severity of medical aspects of alcoholism. On the other hand, SADQ is more useful in studies where the focus is on clinical variables of alcoholism such as family history, ages of onset, and duration of alcohol dependence.

In our study, more than GGT, the TB, CB, AST, and AST/ALT ratio were found to be significantly different between the wards. Expectedly, subjects from the nonpsychiatry ward had more liver dysfunction than those in psychiatry ward. AUDIT total score was correlating with both bilirubin (TB and CB), but the SADQ did not. This supports the idea that AUDIT is more likely to succeed than SADQ in identifying significant physical dysfunction associated with alcoholism.[29] A study by Potamianos *et al.* has reported that SADQ correlated well with ethanol consumption but not with hematological parameters or hepatic toxicity.[30] Similarly in another study by Wodak *et al.*, it was found that severity of alcohol dependence correlated with alcohol intake but negatively correlated with liver disease; thus, suggesting that AUDIT scores relate better with physical parameters.[29] A study by Smith *et al.* found that the SADQ detected severe alcohol dependence in only 9% of alcohol liver disorder group compared to 76% in the detoxification group, thereby suggesting that patients with severe ALD may not have as many features of dependence as seen in those admitted primarily for behavioral reasons. The ALD group were found to be older (mean 50 years), consumed lower levels of alcohol (348 units/30 days), and had a later age of onset.[31] In fact, many authors have attempted to screen for dependence using different cut-offs on AUDIT ranging from 11 to 24 but no consensus has been reached.[13] Despite the study by Rubinsky *et al.*, AUDIT scores that can best predict the severity of alcohol use disorders or the presence of dependence with physiological manifestations as defined by ICD-10, are yet to be firmly established.[17] Based on previous studies and our own findings, we are inclined to believe that AUDIT may be able to screen for medical complications of alcohol use disorders, but may not detect severity based on other clinical aspects of alcoholism. A community-based study using AUDIT along with known severity indicators may help address this question comprehensively.

From the above, it appears that SADQ and AUDIT may be tapping two differing impacts of heavy alcohol use – clinical and biomarkers. This may have implications for choosing measures in different studies. It appears that AUDIT may prove useful as a tool to assess severity in those with medical complications. Some of the limitations of this study are that it was a *post hoc* analysis of another study; we included patients whose AUDIT scores were more than 8 and not the full spectrum of AUDIT. Our study was not primarily designed to confirm if two subtypes of alcohol-related problems exist at all.

CONCLUSION

The two scales, AUDIT and SADQ may be assessing two different aspects of dependence. SADQ could be more useful in studies looking at withdrawal related severity and clinical variables of alcoholism; AUDIT could be more suitable for a more comprehensive evaluation of alcoholism-related medical problems. This needs to be confirmed in larger unselected samples from different community and clinical settings.

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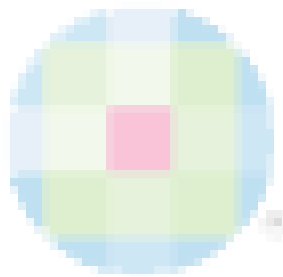
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