

Neuroticism and Substance Use Severity among Male Patients with Substance Use Disorders in North India

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ABSTRACT

Background: Individuals with substance use disorders often report high levels of neuroticism, but such between-group differences do not indicate that the personality domain potentiates dependence severity after the disorder's onset. We explored the norm-referenced Neuroticism profile of a North Indian clinical sample and its association with dependence severity. **Methods:** This cross-sectional observational study included all 50 adult male patients recruited purposively from outpatient de-addiction centres in Punjab, Haryana, and Himachal Pradesh. Substance use disorders were diagnosed by the treating psychiatrist according to ICD-11. Neuroticism was measured using the NEO Five-Factor Inventory, and dependence severity was measured with the Severity of Dependence Scale for the clinically identified primary drug. Pearson's correlation was used for the primary analysis, while exploratory Spearman's correlations examined associations with primary-substance ASSIST and DASS-21 scores.

Results: The mean Neuroticism raw score was 30.18 (SD 5.04), and the mean T-score was 65.46 (SD 6.95). Forty-nine of the 50 participants had T-scores above 50. Neuroticism was not significantly associated with dependence severity ($r = -.061$, $p = .672$). Exploratory correlations with primary-substance ASSIST, depression, anxiety, and stress scores were also nonsignificant. **Conclusion:** Neuroticism was high according to the selected norms but did not differentiate dependence severity in this small, opioid-predominant clinical sample. The cross-sectional SUD-only design cannot establish Neuroticism as a causal or prospective risk factor.

Keywords: neuroticism, substance use disorder, dependence severity, personality, NEO Five-Factor Inventory, India, cross-sectional study

INTRODUCTION

Substance use disorders (SUDs) are diverse psychiatric conditions involving interactions between exposure to a substance, reinforcement, affective regulation, behavioral control, sociocultural influences, and treatment availability. According to the National Survey on Extent and Pattern of Substance Use, alcohol use in India presents in 14.6% of the population, cannabis use in 2.8%, and opioid use in 2.1% of people aged 10–75 years, with a considerable proportion of these individuals being in need of treatment (1). The 11th Revision of the World Health Organization's International Classification of Diseases (ICD-11) includes substance-specific disorders due to use and dependence in its Mental, behavioral, or neurodevelopmental disorders chapter (2). Population and diagnostic criteria describe the burden of illness and patient status but say little about the factors that contribute to the observed heterogeneity in dependence severity among patients with an established disorder. The distinction between a risk factor and a progression factor is essential in the clinical setting since the presence of one does not necessarily indicate the development of the other or the need for treatment.

The Five-Factor Model is used to assess personality dimensions, including Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness (3, 4). The term neuroticism refers to a broad factor that reflects the likelihood of experiencing frequent negative emotions, anxiety, distress, and tension and being vulnerable to emotional instability. It is a stable trait, and not a psychiatric disorder, and has been identified as a risk factor for developing several mental illnesses, including SUD. One's level of neuroticism does not change drastically throughout life and significantly contributes to the probability of developing a psychiatric disorder, but the relationship is not exclusive or deterministic (5). Thus, individual differences in the levels of this personality dimension might partially explain the risk for developing a SUD. However, a single assessment of patients who already have a SUD cannot establish a temporal relationship necessary for causation. The present study can

therefore examine neuroticism as a correlate of current dependence severity but not as a causal or prospective risk factor for substance dependence development.

Nonetheless, a number of mechanisms could connect Neuroticism to outcomes related to substance use. According to the self-medication hypothesis, certain people turn to psychoactive substances in order to relieve unbearable affective states (6). Models based on negative reinforcement likewise describe substance use as becoming progressively governed by the alleviation of distress and withdrawal-related negative affect (7). Developmental research points to an internalizing pathway in which anxiety, depression, coping motives and social withdrawal may contribute to later alcohol problems, though these effects are heterogeneous and frequently hinge on co-occurring externalizing liability (8). Such models suggest that Neuroticism may shape initiation, coping-motivated use, relapse, or response to treatment. They do not, however, necessarily suggest a linear association with current dependence severity within a selected group of treatment-seeking patients. Ongoing substance use, withdrawal, and the consequences of addiction may also intensify negative affect, producing reverse-causal and state-related effects on self-reported personality.

Clinical and community studies tend to report higher Neuroticism and lower Conscientiousness among individuals with SUD than among normative or nonclinical comparison groups (5, 9–12). Among opioid-dependent samples, substantial differences in Neuroticism have been documented relative to matched controls (10). Larger studies likewise point to substance-specific personality patterns rather than a single ‘addictive personality’ (11, 12). Twin and family-based analyses add a further caveat: broad trait–drug associations may in part mirror shared familial liability, while within-pair associations can be more substance-specific (13, 14). Prospective evidence also indicates that personality may predict certain substance-related outcomes, yet traits linked to behavioural control can prove more consistent predictors than Neuroticism (15), and personality may shift as alcohol problems remit over adulthood (16). In a recent longitudinal clinical study, lower Neuroticism predicted short-term recovery but not categorical recovery 6–8 years afterwards, highlighting how findings depend on the outcome and time horizon (17).

Indian evidence is clinically relevant but generally restricted to alcohol dependent samples and various instruments and endpoints. An early study of alcohol and injecting-opioid users found evidence of different NEO profiles by substance (18). In a South Indian sample, an Extraversion domain, not Neuroticism, was associated with baseline drinking and short-term proxies for relapse (19). In contrast, a case-control sample of alcohol dependence found higher Neuroticism in patients, and that scale scores were associated with severity of alcohol consumption and with relapse (20). Further work on behavioral activation/inhibition (21), personality disorders in opioid dependence (22), and hardiness and coping in alcohol dependence (23) revealed that vulnerability is multidimensional. The difference in samples, areas of assessment, instruments used and clinical endpoints preclude applying findings directly to mixed-substance treatment programs operating in North India.

The present study assessed if continuous NEO Neuroticism raw scores were positively associated with dependence severity which was assessed using the Severity of Dependence Scale (SDS), among the present sample of patients with established SUD. T-scores were used only to describe the sample relative to the selected adult norms and exploratory analyses examined association of Neuroticism with the ASSIST score and with current depression, anxiety and stress symptoms. Because the study had neither a non-SUD comparison group nor longitudinal follow-up, all inferential analyses were limited to cross-sectional associations within the clinical sample.

METHODS

Study Design and Setting

This was a cross-sectional observational study with descriptive and analytical elements. The participants were recruited from one cross-sectional examination conducted in outpatient de-addiction services in three geographic regions of India (Punjab, Haryana, and Himachal Pradesh). This report follows the Strengthening the Reporting of Observational Studies in Epidemiology statement for cross-sectional studies (24).

Participants and Sampling

A purposive sampling method was applied because the study included patients with known drug or alcohol use disorder seeking treatment at de-addiction facilities. The treating psychiatrist diagnosed SUD according to the Clinical Descriptions and Diagnostic Requirements of the World Health Organization’s International Classification of Diseases, 11th Revision (ICD-11) (2). Eligible participants were those who attended a participating facility with ICD-11 SUD diagnosis, gave informed consent to participate, and were assessed as clinically appropriate to complete the procedure. Those who declined to participate, did not complete the procedure, or were assessed by the treating psychiatrist as clinically inappropriate to participate were excluded. There were no other exclusion criteria specified by the protocol.

The final analytical cohort included all 50 participants recruited for the study and no participants excluded from analysis. All participants were male; gender identity was not recorded separately. The majority of the participants were engaging in substance use at the time of recruitment: 45 out of 50 (90.0%) participants reported substance use in the past three months, with at least one substance included in the assessment. The study did not include a

concurrent non-SUD control group. The source protocol specified sampling of at least 50 participants and no formal a priori power calculation was applied for the study.

Measures and Instruments

Data were collected using a structured assessment packet consisting of a researcher-developed sociodemographic form and standardized psychometric instruments:

Sociodemographic and Clinical Variables

The study form obtained age, sex, years of education completed, religion, type of family and locality. The SDS's main drug of choice was evaluated clinically in each individual, and for multidrug users it was not assigned only on the basis of the highest ASSIST score.

NEO FIVE-FACTOR INVENTORY

The NEO-FFI consisted of 60 items that assess five broad domains of the Five-Factor Model, each measured with 12 items (4). Participants responded to the items on a five-point Likert scale, from 0 to 4. Reverse-keyed items had been reverse-scored prior to entering scores into the workbook. Neuroticism was the primary exposure, its raw score being the sum of the 12 keyed items of Neuroticism (possible range 0–48). Raw scores were converted into T scores, using the study investigator's selected table of adult norms, where 50 was the normative reference point, and 75 was the highest T-score reported in the norms. In all analysis, association and regression, the uncapped raw score was used.

Depression Anxiety Stress Scales

The 21-item Depression Anxiety Stress Scales (DASS-21) assessed symptoms in the preceding week (25, 26). Items were scored 0 to 3. The seven items in each of the three subscales were summed and multiplied by 2, to maintain comparability with the 42-item DASS metric. Severity bands were used descriptively but not as psychiatric diagnoses.

Alcohol Smoking and Substance Involvement Screening Test

The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) assessed lifetime and recent involvement with alcohol, tobacco, opioids, cannabis, cocaine, methamphetamine, and sedatives (27, 28). Substance-specific involvement scores were derived from Q2–7 per instrument instructions; Q5 is not included in the tobacco score. Conditional blank cells signified 'No' or 'not applicable' and contributed zero. A global score across substances was not created because the instrument produces substance-specific scores and employs conditional branching. To align analyses with the SDS, the ASSIST score corresponding to the clinically determined primary drug was used as a secondary outcome. Injection history was reported separately.

Severity of Dependence Scale

The five-item SDS measures psychological dependence, including impaired control, anxiety about missed use, concern, desire to stop and perceived difficulty abstaining (29). Items are scored from 0 to 3 and summed to a total from 0 to 15, with higher scores indicating greater dependence severity. The named substance was the participant's clinically identified primary drug.

Data Collection Procedure

The study examiner collected sociodemographic data and administered the NEO-FFI, DASS-21, ASSIST, and SDS. Prior to analysis, participant identifiers, item ranges, score formulas, duplicates, missing data and primary-drug labels were audited. All five NEO domain totals, three DASS subscales and total, seven substance-specific ASSIST totals and the SDS total were independently recomputed from item responses and matched the stored scores for every participant. The final workbook contained 50 unique de-identified records and no missing values in the core variables; therefore, no imputation was performed and complete-case analysis included all participants.

Ethical Considerations

Adherence to the Declaration of Helsinki was strictly maintained during the research. In addition, all the participants had given their written consent to the collection and use of their data and were told that their data would be kept confidential. Each participant was given an anonymity code. The participants were also informed that their participation was voluntary, and they had the right to stop attending or withdraw their data at any moment without negative consequences.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics for Windows, Version 25.0. and scale totals were checked against their component items before analysis. Categorical variables were summarized as frequencies and percentages, while continuous variables were summarized as means, standard deviations, and observed ranges. Internal consistency was evaluated using Cronbach's Alpha for the NEO Neuroticism Items, the three DASS-21 Scales and the SDS Scale. A single reliability coefficient was not calculated for ASSIST because it produces substance-specific involvement scores and contains conditional items. Distributions were examined using histograms, normal Q-Q plots, and the Shapiro-Wilk test and the primary hypothesis was tested using Pearson's product-moment correlation between the NEO Neuroticism raw score and SDS total score.

Because the primary-substance ASSIST and DASS-21 scores departed from normality, their exploratory associations with Neuroticism were examined using Spearman's rank-order correlation. A Bonferroni-adjusted significance level of $p < .0125$ was applied to these four secondary correlations. The primary test was two-tailed, with $p < .05$ considered statistically significant. All 50 participants had complete data for the variables included in these analyses.

RESULTS

Participant and Substance-Use Characteristics

The main analysis was done based on complete data provided by all 50 participants enrolled in the study. It was reported that the mean age of the sample was 37.48 years (SD 9.51; range 23-56), while the mean of years of education was 14.06 (SD 4.46; range 5-23). All participants were male, with 33 (66.0%) Hindus and 17 (34.0%) Sikhs. Thirty-one participants (62.0%) lived in joint families, while 29 (58.0%) resided in urban areas. Opioids were used as the most common drugs among 38 (76.0%) participants, followed by alcohol (8; 16.0%) and sedatives (4; 8.0%). It was indicated that 45 participants (90.0%) had recent experience with at least one of the psychoactive substances, while 29 (58.0%) used at least two drugs. In addition, 48 participants (96.0%) had a lifetime exposure to at least two psychoactive substances. Ten participants (20.0%) reported a history of injecting drug use, including 6 (12.0%) who reported injection use during the preceding three months (Table 1).

Characteristic	n (%) or M (SD)	Observed range
Age, years	37.48 (9.51)	23–56
Education, years	14.06 (4.46)	5–23
Sex		
Male	50 (100.0)	—
Religion		
Hindu	33 (66.0)	—
Sikh	17 (34.0)	—
Family type		
Nuclear	15 (30.0)	—
Extended	2 (4.0)	—
Joint	31 (62.0)	—
Living alone	2 (4.0)	—
Locality		
Urban	29 (58.0)	—
Semi-urban	6 (12.0)	—
Rural	15 (30.0)	—
Clinically identified primary drug		
Opioids	38 (76.0)	—
Alcohol	8 (16.0)	—
Sedatives	4 (8.0)	—
Recent use during the preceding three months		
At least one substance	45 (90.0)	—
At least two substances	29 (58.0)	—

Lifetime substance exposure		
Alcohol	20 (40.0)	—
Tobacco	14 (28.0)	—
Opioids	43 (86.0)	—
Cannabis	21 (42.0)	—
Cocaine	2 (4.0)	—
Methamphetamine	1 (2.0)	—
Sedatives	6 (12.0)	—
At least two substances	48 (96.0)	—
Injection history		
Never	40 (80.0)	—
Previously, but not during the preceding three months	4 (8.0)	—
During the preceding three months	6 (12.0)	—

Neuroticism and Clinical Measures

The mean Neuroticism raw score was 30.18 (SD 5.04) and the mean norm-referenced T-score was 65.46 (SD 6.95; range: 50-75). Forty-nine participants (98.0%) scored above the normative mid-point of 50, one participant (2.0%) scored at a T of 50 and none scored below this. Six participants (12.0%) achieved the norm-table upper value of 75 on the T-score, meaning that the distribution for the T-scores could not differentiate between the top scores.

The mean SDS total was 9.36 (SD 3.12) and the mean primary-substance ASSIST score was 25.08 (SD 12.11). The DASS-21 scores were heavily skewed towards the lower ends of the scales with 44 (88.0%) participants falling within the normal Depression band, 36 (72.0%) participants scoring within the normal Anxiety band and 43 (86.0%) participants scoring within the normal Stress band. Internal consistency was good for DASS-21 Depression ($\alpha = .883$), DASS-21 Anxiety ($\alpha = .853$), and SDS ($\alpha = .841$), and modest for NEO Neuroticism ($\alpha = .681$) and DASS-21 Stress ($\alpha = .697$) (Table 2).

Scale	M (SD)	Observed range	Cronbach's α
NEO Neuroticism raw score	30.18 (5.04)	19–39	.681
NEO Neuroticism T-score	65.46 (6.95)	50–75	—
Primary-substance ASSIST score	25.08 (12.11)	0–39	—
Severity of Dependence Scale	9.36 (3.12)	1–14	.841
DASS-21 Depression	3.44 (6.21)	0–32	.883
DASS-21 Anxiety	5.28 (5.82)	0–20	.853
DASS-21 Stress	8.00 (5.91)	0–20	.697

Note: ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; DASS-21 = 21-item Depression Anxiety Stress Scales; SDS = Severity of Dependence Scale. Cronbach's alpha was not calculated for the T-score conversion or ASSIST.

Primary Association with Dependence Severity

Neuroticism raw scores did not correlate with SDS total using Pearson $r = -0.061$ ($p = 0.672$). Therefore, the primary hypothesis that there would be a positive relationship between SDS and neuroticism at least within this sample could not be confirmed.

Secondary Analyses

None of the four exploratory secondary correlations met the Bonferroni-adjusted significance level of $p < .0125$. Neuroticism showed a weak inverse correlation with primary-substance ASSIST score ($\rho = -.219$, $p = .127$) and small positive correlations with DASS-21 Depression ($\rho = .029$, $p = .844$), Anxiety ($\rho = .185$, $p = .198$), and Stress ($\rho = .132$, $p = .360$) (Table 3).

Outcome associated with Neuroticism	Correlation coefficient (p-value)
Severity of Dependence Scale total	$r = -.061$ (.672)
Primary-substance ASSIST score	$\rho = -.219$ (.127)
DASS-21 Depression	$\rho = .029$ (.844)
DASS-21 Anxiety	$\rho = .185$ (.198)
DASS-21 Stress	$\rho = .132$ (.360)

Note: Pearson's r is reported for SDS; Spearman's ρ is reported for ASSIST and DASS-21 outcomes. All p-values are two-sided. The Bonferroni-adjusted threshold for the four secondary correlations was $p < .0125$.

DISCUSSION

Principal Findings

This study has generated two results worth discussing as a single matter. When we compared the observed values against the adult norm table, we observed that neuroticism was increased (mean T score, 65; 49 out of 50 patients scored above the normative mid-point). However, in the study sample, higher levels of neuroticism did not have a greater impact on the dependence severity. These findings address different questions. Norm-referenced scores describe where this clinical sample lies relative to the selected reference table, whereas the within-sample correlation tests whether Neuroticism varies with dependence severity among patients who already have SUD. Therefore, as per our data, we can state that neuroticism was a prominent characteristic of our sample in comparison to the general population, but we cannot assert that it may be used as a measure of the severity of dependence syndrome or a risk factor for developing SUD.

Comparison With International Evidence

The elevated profile for SUD found here is consistent with the evidence base from multiple levels of research including community samples; treatment samples; specialist-treatment samples and opioid-treatment samples that SUD is associated with high neuroticism (5, 9–12). Much of the previous literature, however, has compared substance using/clinical populations to control groups and thus investigated an alternate question. This null within sample correlation for SUD and neuroticism does not refute those group comparisons. Instead, it indicates that factors associated with having SUD may not be identical to factors associated with severity at a single treatment assessment. This more nuanced view of the relationship between neuroticism and SUD is supported by prospective and genetic studies of SUD. For example, in the Australian twin study, many of the broad correlations between neuroticism and drug use were due to familial factors rather than shared within pair effects. Additionally, the relationship between personality traits and outcomes in individuals with SUD appear to be both outcome specific and time dependent. For example, in one clinical sample, neuroticism was predictive of short-term recovery whereas it did not predict long term categorical recovery (17). Similarly, personality changes occurred simultaneously with "maturing out" of drinking problems (16). These findings support the idea that neuroticism can influence either affective vulnerability to developing a SUD or provide coping motives that increase motivation for treatment but do not correlate with currently obtained SDS scores across all known disorders.

Interpretation in the Indian Clinical Context

Indian studies have also produced heterogeneous findings. Gupta et al. found different patterns of personality traits between the alcohol dependent group and the group dependent on injecting opioids (18). However, Soundararajan et al. found that it was the extraverted (vs. neurotic) aspect of personality that best explained both initial drinking levels as well as subsequent relapse measures (19). Conversely, Yadav et al. reported higher prevalence of neuroticism in alcohol dependent subjects and a positive relationship between these aspects of personality and both AUDIT & SADQ scores as well as self-reported relapse (20). The present sample differed because opioids were the primary drug for most participants, SDS was anchored to each participant's clinically identified primary drug, polysubstance exposure was common, and the alcohol- and sedative-primary groups were too small for credible substance-specific comparisons. The findings should therefore not be assumed to apply equally across drug classes.

Why Elevated Neuroticism May Not Track Current Dependence

Several explanations may account for the absence of a correlation: Neuroticism may relate more strongly to initiation, coping-motivated use, relapse or recovery than to dependence severity measured at one clinical assessment. The Severity of Dependence Scale assesses psychological dependence on a specified substance, whereas personality may influence broader motives and affect regulation. Restriction to treatment-seeking patients, the predominance of opioid-primary cases and widespread recent substance use may also have reduced variability or introduced state effects. In addition, the modest internal consistency of the Neuroticism scale may also have attenuated associations.

The T-score upper limit of 75 did not affect the primary correlation because the uncapped raw Neuroticism score was used. It does, however, limit precision at the upper end of the norm-referenced description because six participants reached 75.

Secondary Findings and Clinical Implications

One of the most common examples of such research problems is research that studies the relationship between neuroticism and alcohol use. In fact, such studies have confirmed that this parameter is not significantly associated with participation in primary-substance ASSIST or current depression and anxiety with stress. However, it should be borne in mind that these results are not significant enough since four tests were carried out that were adjusted for multiple comparisons, DASS Depression has an extremely low bottom, and the sample was small. In addition, it does not follow from these results that the variable Neuroticism, interacting with the affective symptoms of the participants, is independent in the general population with SUD. Nevertheless, it was confirmed that high norm-referenced Neuroticism does not simply reflect the measured one-week symptom load in this study.

It should be noted that the results obtained do not allow clinicians to determine the severity of dependence based on personality traits. The degree of dependence and involvement in substance use must be checked by specific validated questionnaires and through diagnostic assessments. However, the study of Neuroticism can still be useful in the individualized analysis of each person's dependence mechanism if this personality trait interacts with stress, manifestations of worry, avoidance, or coping motives. Its practical application may consist in the fact that the relationship between these variables will serve as a kind of context for a long-term therapeutic intervention.

Strengths and Limitations

Strengths include psychiatrist-established ICD-11 diagnoses, item-level verification of every retained score, explicit anchoring of the SDS to the clinically identified primary drug, separate substance-specific ASSIST scoring, use of an uncapped Neuroticism raw score in the primary analysis and multiplicity control for secondary tests. All 50 enrolled participants were analyzed, and no imputation or selective case exclusion was required.

The purposive sample was small, treatment-seeking, entirely male and obtained from outpatient centres in three North Indian states; selection bias and limited generalizability are therefore likely. There was no non-SUD control group and the study was cross-sectional, which is why temporal order, incident risk and causality cannot be determined. Most participants were actively using substances and intoxication or withdrawal status was not recorded systematically. Self-report may additionally introduce recall and social-desirability bias. Duration of use, age at onset, treatment exposure, comorbid psychiatric diagnoses, medication, withdrawal severity and socioeconomic indicators were unavailable. The NEO Neuroticism alpha was modest and the T-score conversion was capped at 75. The normative conversion table used for the NEO-FFI was not based on an India-specific standardisation sample. Accordingly, the T-scores should be interpreted cautiously and should not be taken as estimates of deviation from the contemporary Indian adult population. The principal inferential analyses were therefore based on raw Neuroticism scores. Finally, no formal a priori sample-size calculation was documented, so the study may have lacked power to detect small associations.

Future Research

Further studies should recruit a larger multi-centre cohort with women and gender-diverse participants, balanced primary-substance groups and a control group comprising of non-SUD subjects. Longitudinal assessment after clinical stabilization would help control for trait differences from active-use states and check if Neuroticism predicts relapse, remission and remission. Models should incorporate substance-specific exposure, onset and duration, withdrawal and treatment status and psychiatric comorbidity. These changes will help gain better insights into the substance use pattern and its correlates.

CONCLUSION

The sample from present study had high Neuroticism, but it was not associated with dependence severity, primary-substance involvement or accompanying high depression, anxiety and stress scores. They present study neither demonstrates neuroticism as a causal risk factor for SUD nor supports using it as a proxy for current dependence.

Larger controlled and longitudinal studies are needed to determine whether Neuroticism is more relevant to vulnerability, course, or treatment outcome.

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