

Association of Personality Traits with Stroke Severity and Clinical Outcomes in Patients with Acute Cerebrovascular Accident

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I. Introduction

Cerebrovascular accident remains a major cause of death and acquired disability worldwide. Stroke may result in persistent motor, cognitive, language, behavioural and functional impairment, imposing a substantial burden on patients, families and health systems.

Stroke outcomes are influenced by multiple factors, including age, vascular risk factors, stroke subtype, lesion characteristics and neurological severity at presentation. Hypertension, diabetes mellitus, dyslipidaemia, smoking and atrial fibrillation are established contributors to cerebrovascular disease.

Personality refers to relatively stable patterns of thinking, feeling and behaviour that influence responses to stress, illness and disability. Personality characteristics may influence health-related behaviour, coping, treatment adherence and participation in rehabilitation. Dimensional personality models, including the Big Five framework, have been widely used to characterize individual differences.

Previous research has suggested associations between personality characteristics and cerebrovascular disease. Higher neuroticism has been associated with increased stroke risk in prospective studies, whereas conscientiousness has been associated with more favourable health behaviours and lower risk. Psychological characteristics may also influence post-stroke adaptation and rehabilitation.

However, relatively little research has examined the relationship between personality characteristics and acute stroke severity and clinical outcomes, particularly in Indian tertiary-care settings. The present study therefore evaluated the association of personality category with stroke subtype, neurological severity and clinical outcome among patients with acute CVA.

Objectives

Primary objective: To determine the association between personality characteristics and stroke severity and short-term clinical outcomes among patients with acute cerebrovascular accident.

Secondary objectives: (1) to describe the clinical profile of patients with acute CVA; and (2) to examine the relationship between personality category and stroke subtype.

II. Methods

Study design and setting

This was a prospective observational cohort study conducted over 24 months in the Department of Medicine at a tertiary-care hospital in Maharashtra, India. Patients presenting with CVA during the study period constituted the source population.

Participants

A total of 200 patients aged 18–80 years with confirmed CVA were included using systematic sampling. Eligibility criteria included confirmed cerebrovascular accident and provision of informed consent. Patients younger than 18 years, those who did not provide consent, those with neurological deficits due to nonvascular causes, those with a known history of severe psychiatric illness, and those with significant pre-existing cognitive impairment were excluded.

Clinical assessment

Sociodemographic variables included age, sex, marital status, education, occupation and monthly income. Clinical information was obtained from patient interviews and medical records. Anthropometric measurements and laboratory parameters, including lipid profile, were recorded. A detailed neurological

examination was performed. Stroke severity was assessed using the National Institutes of Health Stroke Scale (NIHSS).

Stroke classification

Cerebrovascular accident was confirmed clinically and by appropriate neuroimaging. Patients were classified as having ischemic or hemorrhagic stroke.

Personality assessment

Personality assessment was performed using the personality instrument specified in the original study protocol. The reported analytical categories were neuroticism, conscientiousness, agreeableness, extraversion and openness. *IMPORTANT FOR FINAL SUBMISSION: The source study documentation describes the Personality Inventory for DSM-5 (PID-5), whereas the reported results use Big Five categories. These are not interchangeable frameworks. The exact instrument and scoring algorithm used in the study must be verified against the original case-record forms before submission, and this section must then be finalized accordingly.*

Outcome assessment

Clinical outcome was categorized as improved, partially improved, same status, deteriorated, or death. The exact timing of outcome assessment should be inserted from the study records before submission: [insert prespecified assessment time point].

Ethics

The study was conducted after approval from the Institutional Ethics Committee and in accordance with the Declaration of Helsinki. Written informed consent was obtained from participants. [Insert IEC/IRB name, approval number and approval date].

Statistical analysis

Categorical variables were summarized as frequencies and percentages. Associations between categorical variables were assessed using the chi-square test, with Fisher exact testing where appropriate. A two-sided p value <0.05 was considered statistically significant. [Insert statistical software and version].

The reported analysis examined associations between personality category and stroke subtype, NIHSS severity and clinical outcome, as well as associations of stroke subtype and NIHSS severity with clinical outcome. The present source data do not include multivariable regression estimates; therefore, no adjusted effect estimates are reported in this manuscript.

III. Results

Baseline characteristics

Among 200 patients, 124 (62.0%) were male and 76 (38.0%) were female. Eighty patients (40.0%) were aged >70 years. Hypertension was present in 132 (66.0%), diabetes mellitus in 86 (43.0%), dyslipidaemia in 80 (40.0%), smoking in 24 (12.0%), alcohol consumption in 29 (14.5%), and atrial fibrillation in 15 (7.5%). Nine patients (4.5%) had a previous history of CVA.

Characteristic	n (%)
Total	200 (100)
Male	124 (62.0)
Female	76 (38.0)
Age >70 years	80 (40.0)
Hypertension	132 (66.0)
Diabetes mellitus	86 (43.0)
Dyslipidaemia	80 (40.0)
Smoking	24 (12.0)
Alcohol consumption	29 (14.5)
Atrial fibrillation	15 (7.5)
Previous CVA	9 (4.5)

Stroke subtype and severity

Ischemic stroke accounted for 145 (72.5%) cases and hemorrhagic stroke for 55 (27.5%). According to the reported NIHSS categories, 13 (6.5%) patients had mild stroke, 73 (36.5%) moderate stroke, 63 (31.5%) moderate-to-severe stroke and 51 (25.5%) severe stroke.

Stroke characteristic	n (%)
Ischemic stroke	145 (72.5)
Hemorrhagic stroke	55 (27.5)
Mild NIHSS category	13 (6.5)
Moderate	73 (36.5)
Moderate-to-severe	63 (31.5)

Severe	51 (25.5)
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Personality categories

Neuroticism was the most frequently reported category (65/200, 32.5%), followed by conscientiousness (48/200, 24.0%), openness (34/200, 17.0%), agreeableness (27/200, 13.5%) and extraversion (26/200, 13.0%).

Personality category	n (%)
Neuroticism	65 (32.5)
Conscientiousness	48 (24.0)
Agreeableness	27 (13.5)
Extraversion	26 (13.0)
Openness	34 (17.0)

Association between personality and stroke subtype

Personality category was not significantly associated with stroke subtype ($\chi^2=7.90$, $p=0.095$). Ischemic stroke predominated across all personality categories.

Association between personality and stroke severity

Personality category was significantly associated with NIHSS severity ($\chi^2=76.79$, $p<0.001$). Among patients classified as neuroticism, 34/65 (52.3%) had severe stroke. Among patients classified as openness, 21/34 (61.8%) had moderate stroke and 2/34 (5.9%) had severe stroke.

Personality	Mild	Moderate	Moderate-severe	Severe
Neuroticism	0	9	22	34
Conscientiousness	1	17	20	10
Agreeableness	2	11	11	3
Extraversion	2	15	7	2
Openness	8	21	3	2

Personality and clinical outcome

Clinical outcome differed significantly across personality categories ($\chi^2=81.69$, $p<0.001$). Improvement was most frequent among patients classified as openness (67.6%), whereas deterioration (43.1%) and mortality (18.5%) were most frequent among those classified as neuroticism.

Personality	Improved	Partially improved	Same	Deteriorated	Death
Neuroticism	5 (7.7%)	6 (9.2%)	14 (21.5%)	28 (43.1%)	12 (18.5%)
Conscientiousness	10 (20.8%)	15 (31.3%)	12 (25.0%)	8 (16.7%)	3 (6.3%)
Agreeableness	6 (22.2%)	10 (37.0%)	7 (25.9%)	3 (11.1%)	1 (3.7%)
Extraversion	12 (46.2%)	6 (23.1%)	6 (23.1%)	0	2 (7.7%)
Openness	23 (67.6%)	4 (11.8%)	2 (5.9%)	5 (14.7%)	0

Stroke subtype and clinical outcome

Stroke subtype was significantly associated with clinical outcome ($\chi^2=18.28$, $p=0.001$). Improvement occurred in 48/145 (33.1%) patients with ischemic stroke and 8/55 (14.5%) with hemorrhagic stroke. Deterioration occurred in 32.7% of hemorrhagic versus 17.9% of ischemic stroke patients, while mortality was 18.2% and 5.5%, respectively.

NIHSS severity and clinical outcome

NIHSS severity was strongly associated with clinical outcome ($\chi^2=161.42$, $p<0.001$). Among patients with mild stroke, 92.3% improved, whereas among those with severe stroke, 52.9% deteriorated and 27.5% died.

Vascular risk factors and outcome

Hypertension was not significantly associated with clinical outcome in the unadjusted analysis ($\chi^2=6.18$, $p=0.186$). Diabetes mellitus was also not significantly associated with clinical outcome ($\chi^2=8.43$, $p=0.077$). These findings should not be interpreted as evidence that these risk factors lack prognostic importance because confounding and statistical power were not fully addressed by the reported analyses.

IV. Discussion

The principal finding of this prospective observational study was that personality category was significantly associated with stroke severity and short-term clinical outcome, while no statistically significant association was observed with ischemic versus hemorrhagic stroke subtype.

The cohort was predominantly older and male, and hypertension, diabetes mellitus and dyslipidaemia were the most frequent vascular comorbidities. Ischemic stroke was the predominant subtype. These observations are consistent with the established epidemiological profile of stroke.

Neuroticism was the most frequent reported personality category and was associated with a higher proportion of severe stroke. In contrast, openness and extraversion were more frequently represented among patients with milder or moderate neurological deficits. Personality may influence health behaviours, coping, treatment-seeking, adherence and rehabilitation participation; however, these pathways were not directly measured in the present study.

Personality category was also strongly associated with clinical outcome. Patients classified as openness had the highest proportion of improvement, whereas neuroticism had the highest proportions of deterioration and mortality. These findings are hypothesis-generating and should not be interpreted as evidence of a causal effect of personality on recovery.

An important alternative explanation is reverse causation. Acute stroke can alter cognition, mood, behaviour and emotional regulation, potentially influencing responses to personality questionnaires. The timing of personality assessment is therefore critical to interpretation.

Baseline NIHSS was strongly associated with outcome, as expected. Because personality category was also associated with NIHSS severity, neurological severity may confound or mediate the observed relationship between personality and outcome. Adjusted analysis is therefore needed before personality can be considered an independent prognostic marker.

Clinical implications

The findings support further investigation of psychological and behavioural characteristics in stroke rehabilitation. Personality assessment may eventually help identify patients who require additional psychosocial support, counselling or rehabilitation engagement strategies. However, the current evidence is insufficient to recommend personality testing as a routine prognostic tool.

Strengths

- Prospective observational design.
- Defined tertiary-care clinical population.
- Inclusion of ischemic and hemorrhagic stroke.
- Use of NIHSS for neurological severity.
- Systematic assessment of personality characteristics.
- Evaluation of both stroke severity and clinical outcome.

Limitations

- Single-centre design and modest sample size limit generalizability.
- Observational design precludes causal inference.
- Post-stroke personality assessment may be influenced by acute neurological, cognitive or emotional changes.
- The exact timing and operational definition of the reported clinical outcome must be specified before submission.
- Important potential confounders, including depression, anxiety, cognitive impairment, rehabilitation intensity and social support, were not incorporated into the reported analyses.
- Multivariable adjusted estimates and confidence intervals were not available in the source analysis.
- The personality-instrument description requires reconciliation because the source Methods describe PID-5 while the Results use Big Five categories.

V. Conclusion

Personality category was significantly associated with stroke severity and short-term clinical outcome in this cohort of patients with acute cerebrovascular accident, but not with ischemic versus hemorrhagic stroke subtype. Neuroticism was associated with a greater proportion of severe stroke, deterioration and mortality, whereas openness and extraversion were associated with more favourable outcomes. These findings are hypothesis-generating. Multicentre prospective studies using validated personality instruments, standardized functional outcomes, prespecified follow-up and multivariable adjustment are required to determine whether personality provides independent prognostic information.

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