TITLE: CORRELATIONAL ANALYSIS OF CLINICAL VARIABLES IN STROKE PATIENTS: A CROSS-SECTIONAL STUDY

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Abstarct: *This study investigated significant correlations among clinical variables in 80 stroke patients, focusing on age, blood pressure, renal function, inflammation, and neurological scores. Supervised by neurologists and cardiologists, data collected included systolic and diastolic blood pressure, stenosis, ESR, creatinine, NIHSS, and mRS scores(Modified Rankin Scale) , analysed with Pearson's correlation in JASP and Excel ($p < 0.05, 0.01, 0.001$). Key results reveal that age is positively correlated with stenosis ($r = 0.207$, $p = 0.050$), indicating vascular aging may elevate stroke risk. Stenosis also correlates with creatinine ($r = 0.287$, $p = 0.009$), and ESR with creatinine ($r = 0.221$, $p = 0.050$), suggesting an inflammatory impact on renal health. Systolic BP correlates with NIHSS ($r = 0.227$, $p = 0.042$) and mRS scores ($r = 0.226$, $p = 0.048$), linking high BP to greater stroke severity and poorer outcomes. NIHSS and mRS scores exhibit a strong correlation ($r = 0.629$, $p < 0.001$), reinforcing their combined value in assessing impairment. Findings highlight the role of vascular, renal, and inflammatory health in stroke pathology, supporting a holistic management approach for improved outcomes.*

Introduction: Stroke remains one of the most challenging global health issues, with high rates of morbidity and mortality worldwide. Strokes can significantly impact quality of life, and their complexity stems from the numerous factors that contribute to their onset, severity, and recovery trajectories. Among these, blood pressure, age, renal function, and inflammatory markers have been identified as influential factors that not only correlate with each other but also affect the likelihood of adverse outcomes in stroke patients. Correlational studies

play an essential role in stroke research by allowing researchers to map out these interconnections and assess the impact of various clinical variables. Such studies offer a foundation for understanding how age, blood pressure, renal health, inflammation, and neurological impairment might interact in the context of stroke, helping clinicians recognize which variables may require closer monitoring or targeted intervention. By examining these relationships in stroke patients, this study aims to provide insights that could lead to more comprehensive, multi-faceted approaches to patient care and recovery.

Methodology: This study utilized a cross-sectional design, involving 80 patients of TMA , Tashkent Uzbekistan, diagnosed with ischemic stroke and treated under the guidance of experienced neurologists and cardiologists. Inclusion criteria required that patients have a confirmed stroke diagnosis and be over the age of 18, with complete and accessible medical records available for analysis. Key variables collected included age, blood pressure measurements (both systolic and diastolic), stenosis levels, ESR (Erythrocyte Sedimentation Rate), creatinine levels, and neurological scores, specifically the NIHSS (National Institutes of Health Stroke Scale) and mRS (Modified Rankin Scale). Blood pressure measurements were taken both during the stroke event and in regular clinical assessments, while ESR and creatinine levels were collected as indicators of inflammatory and renal health, respectively. Pearson's correlation was chosen as the statistical method for its suitability in identifying the strength and direction of linear relationships between these variables. Data analysis was conducted using JASP and Microsoft Excel, and correlations were considered statistically significant at p-values < 0.05 , AI assistance is used for text generation with thorough accuracy and quality checks.

Results:- This study included 80 stroke patients, of whom 48 were male, and the remaining 32 were female, with an average age of 67.89 years (±8.2 years). The patients had an average BMI of 25.56, which aligns with the general demographic profile of stroke patients, where advancing age and higher BMI are recognized risk factors. Given the prevalence of males in the study population, the findings may reflect gender-specific aspects of stroke risk and recovery.

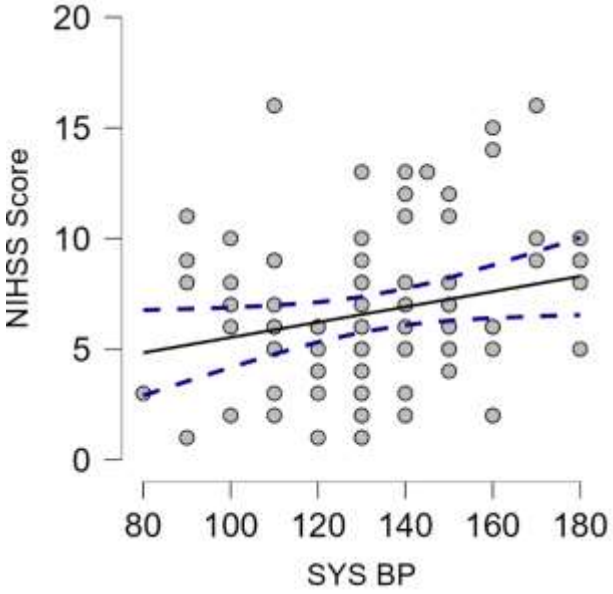
The correlation analysis identified significant associations between several key clinical variables, which provides valuable insights into stroke pathology:

1. Age and Stenosis: The positive correlation between age and stenosis (r = 0.207, p = 0.050) suggests that vascular aging may play a role in stroke susceptibility and severity. Stenosis, or narrowing of the arteries, is a common condition in older adults, often due to a buildup of plaque and loss of arterial elasticity. In the context of stroke, arterial stenosis can reduce blood flow to the brain, exacerbating ischemic events and contributing to poorer outcomes. This finding implies that older patients might have more extensive vascular blockages, increasing their stroke risk and potentially complicating recovery.

2. Stenosis and Creatinine: The correlation between stenosis and creatinine (r = 0.287, p = 0.009) points to a link between vascular health and renal function. Higher creatinine levels, indicative of reduced kidney function, may be associated with more severe arterial stenosis. This finding aligns with existing research indicating that impaired kidney function is associated with worse cardiovascular health. In stroke patients, this relationship could mean that those with compromised renal function may also have more significant vascular issues, necessitating careful management of both systems to mitigate stroke severity.

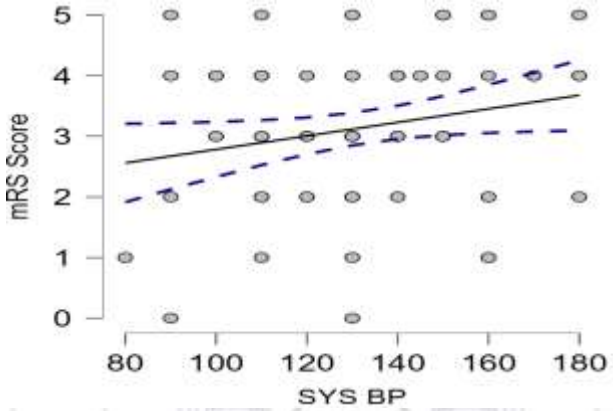
3. ESR and Creatinine: Elevated ESR (Erythrocyte Sedimentation Rate) and creatinine levels were positively correlated (r = 0.221, p = 0.050), suggesting that systemic inflammation may influence renal health in stroke patients. High ESR levels reflect an inflammatory response, which is often implicated in the progression of atherosclerosis—a key factor in stroke. Inflammation can worsen kidney function, which, in turn, impacts cardiovascular health. This association highlights the potential role of anti-inflammatory therapies in managing stroke patients with concurrent renal impairment to improve overall health outcomes.

Graph 1. NIHSS Score vs. SYS BP



4. SYS BP and NIHSS Score: Systolic blood pressure (SYS BP) showed a positive correlation with NIHSS scores (r = 0.227, p = 0.042), indicating that higher systolic blood pressure is associated with increased stroke severity. The NIHSS (National Institutes of Health Stroke Scale) measures stroke severity, with higher scores reflecting greater neurological impairment. This result suggests that elevated systolic blood pressure at the time of stroke may be a critical factor in determining the extent of neurological damage. For patients, managing systolic blood pressure could be crucial not only for preventing stroke but also for minimizing the severity of strokes that do occur.

Graph2. SYS BP vs. mRS Score

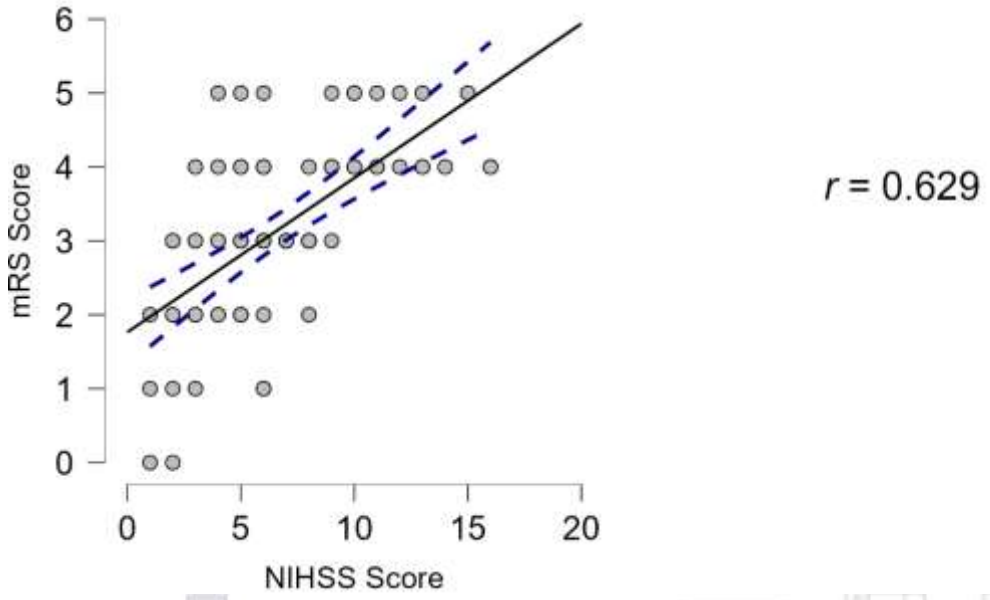


5. SYS BP and mRS Score: Similarly, the association between systolic blood pressure and mRS (Modified Rankin Scale) scores (r = 0.226, p = 0.048) highlights the potential influence of blood pressure on

functional outcomes. The mRS assesses the degree of disability or dependence in stroke patients, with higher scores indicating worse outcomes. This correlation suggests that elevated blood pressure could contribute to long-term functional impairment post-stroke, reinforcing the importance of blood pressure management as part of both acute and long-term stroke care.

6. SYS BP and Time Since Disease Onset: The inverse correlation between systolic blood pressure and the time since disease onset ($r = -0.256$, $p = 0.021$) implies that blood pressure tends to be higher closer to the stroke event. This finding suggests an acute hypertensive response associated with stroke onset, possibly as the body's reaction to a critical ischemic episode. Managing this acute elevation could be important for immediate care to prevent worsening of stroke severity and facilitate better stabilization during the acute phase.

Graph3 .NIHSS Score vs. mRS Score



7. NIHSS Score and mRS Score: The strong positive correlation between NIHSS and mRS scores ($r = 0.629$, $p < 0.001$) indicates that neurological impairment (as measured by NIHSS) is closely linked with functional outcomes (as measured by mRS). This finding reinforces the combined utility of these scores in assessing both the immediate neurological damage and the functional impact on the patient's daily life. Clinically, these scores together provide a comprehensive understanding of a patient's status and can help guide rehabilitation efforts aimed at improving both neurological and functional recovery.

Contextual Implications

This study's findings highlight the interconnectedness of vascular, renal, and inflammatory health in influencing stroke risk and recovery. With the average patient age of nearly 68 years and a BMI of 25.56, this cohort represents a population at increased risk due to age-related vascular and metabolic factors. The significant correlations between blood pressure, vascular health markers, and neurological scores emphasize the need for a multi-faceted approach to stroke care, particularly in managing blood pressure and addressing underlying renal or inflammatory conditions. In practice, stroke management for this population could benefit from early interventions targeting blood pressure, vascular health, and inflammation to reduce severity and improve functional recovery post-stroke.

Discussion: The study's findings illustrate how clinical variables interact within the context of stroke. Age and stenosis, for instance, appear to be moderately correlated, supporting the view that vascular health declines with age and that older individuals may require closer vascular monitoring. The correlation between stenosis and creatinine levels further emphasizes the relationship between renal and vascular health, pointing to the potential benefits of renal health monitoring in reducing stroke risk or complications. The connection between ESR and creatinine aligns with known links between inflammation and kidney function, reinforcing the importance of controlling inflammation in stroke management. The significant correlations between systolic blood pressure and both NIHSS and mRS scores provide evidence that high blood pressure may exacerbate stroke severity and hinder recovery, suggesting that blood pressure management could be pivotal in improving functional outcomes. The inverse correlation between systolic blood pressure and the time since stroke onset points to the potential benefit of early blood pressure interventions in acute stroke phases. Lastly, the robust correlation between NIHSS and mRS scores demonstrates the interrelationship between neurological impairment and functional disability, affirming their combined value in comprehensive stroke assessments.

Conclusion: This study presents significant correlations among clinical variables that influence stroke severity and outcomes. These findings indicate that factors such as age, renal health, inflammation, and, notably, blood pressure, play substantial roles in shaping stroke patients' experiences and recovery potential. The insights from this

study underscore the importance of a multi-disciplinary approach to stroke care, where neurological, cardiovascular, and renal factors are addressed together to optimize patient outcomes. Future research with larger sample sizes and longitudinal designs could provide further clarity on these relationships and strengthen the evidence for integrated stroke care strategies.

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