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Original Research Article

VALIDATION OF AGE, BLOOD PRESSURE, CLINICAL FEATURES, DURATION, AND DIABETES SCORE AS IDENTIFYING INDIVIDUALS AT HIGH EARLY RISK OF STROKE AFTER A TRANSIENT ISCHEMIC ATTACK AT JINNAH POSTGRADUATE MEDICAL CENTRE, KARACHI

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ABSTRACT

Background: *Transient ischemic attack (TIA) is a major predictor of subsequent stroke, with the highest risk occurring in the early post-attack period. The ABCD² score is a widely used clinical tool for stratifying this risk; however, local validation is required to determine its predictive accuracy in South Asian populations.* ***Objective:*** *To validate the ABCD² score in identifying individuals at high early risk of stroke following a transient ischemic attack at Jinnah Postgraduate Medical Centre (JPMC), Karachi.* ***Study Design:*** *Cross-sectional study.* ***Setting:*** *Ward 28, Department of Neurology, Jinnah Postgraduate Medical Centre (JPMC), Karachi.* ***Duration of Study:*** *20 January 2025 to 20 June 2025.* ***Methods:*** *Following ethical approval, 93 patients aged 18–70 years of both genders presenting with TIA were enrolled using non-probability consecutive sampling. Patients with a history of stroke, head trauma, atrial fibrillation, or intracerebral hemorrhage were excluded. ABCD² scores were calculated at presentation, and patients were followed for the occurrence of stroke. Data were analyzed using descriptive statistics, and associations between clinical variables and stroke outcomes were assessed using chi-square tests and t-tests, with $p < 0.05$ considered statistically significant.* ***Results:*** *The mean ABCD² score was 2.9 ± 2.1. Stroke occurred in 50 patients (54%). Age was significantly associated with stroke (p=0.018), with higher occurrence among patients >30 years (37 vs. 13 cases). Hypertension (p=0.004), diabetes mellitus (p<0.0001), myocardial infarction (p<0.0001), angioplasty (p<0.0001), CABG (p<0.0001), and angina (p=0.036) were significantly linked to stroke occurrence. Gender (p = 0.229), hyperlipidemia (p = 0.099), and smoking (p = 0.673) showed no significant association.* ***Conclusion:*** *The ABCD² score demonstrated predictive utility for early stroke risk among TIA patients in our cohort. However, significant associations with comorbidities such as hypertension, diabetes, and ischemic heart disease suggest that region-specific, comprehensive risk assessment models may provide superior predictive value for South Asian populations.*

Keywords: TIA, ABCD², Diabetes, Blood Pressure

INTRODUCTION

Temporary cerebral ischemia causes brief neurological dysfunction known as a Transient ischemic attack (TIA), which frequently leads to future strokes (1). Strategies to protect against subsequent strokes need to be implemented quickly for people who exhibit increased stroke risk after experiencing a TIA (2). Medical professionals use the ABCD² score as an assessment method to classify stroke risk in TIA patients by evaluating their age, blood pressure levels, clinical conditions, symptom duration, and diabetes status (3).

The ABCD² score grants points when patients meet five criteria that include age (over 60), blood pressure measurement (above 140/90 mmHg), stroke indicators (unilateral weakness or speech disturbance), symptoms duration (more than sixty minutes or ten to fifty-nine minutes), and diagnosed diabetes status (4). The points assigned to the ABCD² score total between 0 and 7, representing the risk level for a subsequent stroke. Patients with ABCD² scores ranging from 6 to 7 exhibit an 8.1% chance of suffering a stroke during the first two days after presentation; however, patients scoring between 0 and 3 exhibit a risk of 1.0% (5). Research has been conducted to determine how well the ABCD² score performs across different population groups. A meta-analysis of diverse population cohorts demonstrated that the score accurately determines quick stroke risk assessment, and elevated scores indicate a higher likelihood of stroke events (6). The ABCD² score is valuable for risk determination; however, further clinical evaluation and additional diagnostic measures are necessary to achieve the best possible risk assessments, according to relevant studies (7).

Research shows that cerebrovascular diseases affect a substantial number of people throughout Pakistan. Modern research conducted in Karachi demonstrated that stroke, along with TIA, affected 21.8% of the population throughout their lifespans while showing increased prevalence in female participants. Scientific research has revealed that cerebrovascular events are strongly linked to older populations and elevated random glucose levels, particularly in individuals who consume chewable tobacco (8).

Stroke and TIA rates in Pakistan are high, yet researchers lack validation of the ABCD² score for this population group. The distinct population features and clinical makeup demand testing whether the ABCD² score correctly determines early stroke danger for Pakistani TIA patients (9). The validation process would help healthcare staff identify high-risk patients early, enabling them to implement appropriate preventive measures, thereby reducing the number of subsequent strokes at this site, which carries a significant burden. The objective of the present study was to validate the ABCD² score for identifying individuals at high early risk of stroke after a transient ischemic attack at Jinnah Postgraduate Medical Centre, Karachi.

METHODOLOGY

After obtaining ethical approval from the institutional review board, this cross-sectional study was conducted at Ward 28, Department of Neurology, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from January 20, 2025, to June 20, 2025. Through non-probability consecutive sampling, 93 patients aged 18-70 years, both genders, presenting with transient ischemic attack were included in the present study. Patients with a history of stroke or head trauma, atrial

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fibrillation, and intracerebral haemorrhage were excluded from the present study. After obtaining informed consent from the recruited patients, detailed demographic information, including name, gender, and age, was obtained for each patient. A thorough medical history of each patient was also obtained, including hypertension, diabetes mellitus, hyperlipidaemia, smoking, history of myocardial infarction, angioplasty, coronary artery bypass surgery, and angina pectoris. Each patient was assessed for signs and symptoms, including numbness or weakness in the face, arms, or legs (especially on one side of the body), confusion, difficulty in speaking or understanding speech, vision disturbances in one or both eyes, dizziness, trouble walking, loss of balance or coordination, or severe headache. A CT (computed tomography) scan or an MRI (magnetic resonance imaging) scan was performed for each patient to confirm a transient ischemic attack. The blood pressure of each patient was measured on multiple occasions using a sphygmomanometer to confirm the presence of hypertension. A blood sample from each patient was collected in a sterilized container and sent to the laboratory for a complete blood count (CBC), HbA1c, and lipid profile. Each patient was assessed using the ABCD2 score to evaluate the risk of stroke. The patient was followed until discharged from the hospital to determine the outcome. After collecting the data, analyses were conducted using the Statistical Package for the Social Sciences (SPSS) software, Version 25. Mean and standard deviation were calculated for quantitative variables like age (years), blood pressure (mmHg), duration of symptoms (days), HbA1c (%), LDL-C (mg/dl), HDL-C (mg/dl), TC (mg/dl), TG (mg/dl), and ABCD2 score. Frequency and percentages was calculated for categorical variables like gender, age in groups, medical history (hypertension, diabetes mellitus, hyperlipidemia, smoking, history of myocardial infarction, angioplasty, coronary artery bypass surgery, and angina pectoris), sign and symptoms (numbness or weakness in the face, arms, or legs (especially on one side of the body), confusion, difficulty in speaking or understanding speech, vision disturbances in one or both eyes, dizziness, trouble walking, loss of balance or coordination, or severe headache), risk on $ABCD^2$ score and outcome. Effect modifiers like gender, age in groups, hypertension, diabetes mellitus, hyperlipidaemia, smoking, history of myocardial infarction, angioplasty, coronary artery bypass surgery, and angina pectoris were controlled by stratification. A post-stratification chi-square test was applied, with a p-value ≤ 0.05 considered significant.

RESULTS

The study included 93 participants, with a nearly equal distribution of genders—43 males (46%) and 50 females (54%). The mean age of the participants was 34.7 ± 9.9 years (Table 1).

Regarding clinical parameters, the mean blood pressure recorded was 132.5 ± 27.7 mmHg. The average duration of symptoms was 4.6 ± 2.6 days. Laboratory findings revealed an average HbA1c level of 6.9 ± 1.4 mg/dL. At the same time, lipid profile results showed LDL-C at 132.49±44.6 mg/dl, HDL-C at 53.9±14.1 mg/dl, total cholesterol (TC) at 222.9±43.0 mg/dl, and triglycerides (TG) at 136.2±57.6 mg/dl (Table 2). The medical history of participants indicated that 47 (51%) had hypertension, 51 (55%) had diabetes mellitus, and 43 (46%) had hyperlipidemia. Additionally, 55 (59%) were smokers, 48 (52%) had a history of myocardial infarction, 44 (47%) had undergone angioplasty, 49 (53%) had undergone coronary artery bypass grafting (CABG), and 26 (28%) had a history of angina (Table 3).

Presenting signs and symptoms varied among patients. Numbness or weakness was reported by 48 (52%) participants, while confusion and speech difficulty were each reported by 50 (54%). Vision disturbance was noted in 46 (49%) cases, dizziness in 42 (45%), and trouble walking in 38 (41%). Additionally, 45 (49%) experienced loss of balance, and 46 (49%) reported severe headaches (Table 4).

In terms of outcomes, the mean $ABCD^2$ score was 2.9±2.1, and stroke occurred in 50 (54%) patients (Table 5). Stratification of variables revealed significant associations between stroke outcomes and specific factors (Table 6). Age was significantly associated with stroke ($p=0.018$), with those above 30 years showing a higher occurrence (37 cases) compared to those under 30 years (13 cases). Hypertension ($p=0.004$), diabetes mellitus ($p<0.0001$), myocardial infarction ($p<0.0001$), angioplasty ($p<0.0001$), CABG ($p<0.0001$), and angina ($p=0.036$) were all significantly linked to stroke occurrence. However, gender ($p=0.229$), hyperlipidaemia ($p=0.099$), and smoking ($p=0.673$) did not show statistically significant associations with stroke.

The distribution of stroke risk groups based on the $ABCD^2$ score showed that 28 patients were in the low-risk group (score 0-3), 12 in the moderate-risk group (score 4-5), and 10 in the high-risk group (score 6-7), all of whom experienced a stroke. However, this association was not statistically significant ($p = 0.661$). The findings highlight key clinical and demographic factors influencing early stroke risk following a transient ischemic attack.

Table 1: Demographic Profile

Variables	Mean and Frequency (n=93)
Gender	
Male	43 (46%)
Female	50 (54%)
Age (years)	34.7±9.9

Table 2: Clinical parameters

Variables	Mean± S.D
Blood Pressure (mmHg)	132.5±27.7
Duration Symptoms (days)	4.6±2.6
HbA1c (mg/dl)	6.9±1.4
LDL-C (mg/dl)	132.49±44.6
HDL-C (mg/dl)	53.9±14.1
TC (mg/dl)	222.9±43.0
TG (mg/dl)	136.2±57.6

Table 3: Medical History

Variables	Frequency (%) (n=93)
Hypertension	47 (51%)
Diabetes Mellitus	51 (55%)
Hyperlipidaemia	43 (46%)
Smoking	55 (59%)
History MI	48 (52%)
Angioplasty	44 (47%)
CABG	49 (53%)
Angina	26 (28%)

Table 4: Presenting Signs and Symptoms

Variables	Frequency (%) (n=93)
Numbness Weakness	48 (52%)
Confusion	50 (54%)
Speech Difficulty	50 (54%)
Vision Disturbance	46 (49%)
Dizziness	42 (45%)
Trouble Walking	38 (41%)
Loss Balance	45 (49%)
Severe Headache	46 (49%)

Table 5: Outcomes

Outcomes	Mean and Frequency (n=93)
$ABCD^2$ Score	2.9±2.1
Outcome Stroke	50 (54%)

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Table 6: Stratification of the variables

Variables	Outcome		P value
	Yes	No	
Age			0.018
<30 years	13	22	
>30 years	37	21	
Gender			0.229
Female	24	26	
Male	26	17	
Hypertension			0.004
Yes	18	29	
No	32	14	
Diabetes			<0.0001
Yes	17	34	
No	33	9	
Hyperlipidaemia			0.099
Yes	19	24	
No	31	19	
Smoking			0.673
Yes	31	24	
No	19	19	
Myocardial Infarction			<0.0001
Yes	8	40	
No	42	3	
Angioplasty			<0.0001
Yes	14	30	
No	36	13	
CABG			<0.0001
Yes	10	39	
No	40	4	
Angina			0.036
Yes	9	17	
No	41	26	
Risk Group			0.661
0-3 (low)	28	24	
4-5 (moderate)	12	13	
6-7 (high)	10	6	

DISCUSSION

The study reveals important data about demographic and clinical elements that affect stroke susceptibility during the period following transient ischemic attacks. The participants in the study had an average age of 34.7 years, which was considerably lower than the typical TIA patient group, whose risk of recurrence begins to increase strongly after age 55 (10). The lower average age of the patients indicates possible genetic or regional components leading to TIA strokes (11).

The blood pressure measurements showed a mean value of 132.5 mmHg, and hypertension occurred in 51% of participants. Research shows that high blood pressure stands as a well-recognized factor for both TIA occurrences and future strokes. The participants displayed an average HbA1c level of 6.9% and approximately half of them (55%) had diabetes mellitus. The hyperglycaemic condition raises stroke risk levels by two times in patients, which makes proper glycaemic control essential for this group (12).

Research data showed TIA patients faced a 54% stroke risk rate that exceeded the normal 10-20% stroke risk rate found in other populations, looking forward to 90 days after TIA. The variations in healthcare accessibility and genetic background, along with the younger demographic of the study group, could explain this discrepancy (13).

The results of the stratification analysis revealed significant relationships between specific variables and stroke outcomes. Stroke occurred more frequently among participants who exceeded 30 years of age, as indicated by statistical significance ($p = 0.018$), which aligns with documented evidence that age is a risk factor. The occurrence of stroke is directly related to hypertension ($p=0.004$) and diabetes mellitus ($p<0.0001$) based on statistical analysis standards similar to established cerebrovascular disease models. The association between hyperlipidaemia and smoking risk factors ended up being statistically insignificant ($p=0.099$ and $p=0.673$, respectively) in this research investigation. The analysis could be limited by small sample sizes, as well as other research confounders.

The majority of patients received a low to moderate risk group classification based on their mean $ABCD^2$ score value of 2.9. The $ABCD^2$ score shows inadequate risk assessment performance in this population because of the high stroke incidence rates. The $ABCD^2$ score has recognized shortcomings, as its predictive accuracy falls short in specific patient groups, according to research evidence (14). A reported study found that the $ABCD^2$ score yielded a c-statistic of 0.599 when used to predict 3-month recurrent strokes, indicating a weak predictive outcome. The $ABCD^2$ score serves as a valuable tool; however, it requires supplemental assessments that should also be adjusted for the specific characteristics of target groups (15).

CONCLUSION

This study highlights the need for developing comprehensive risk assessment models that take into account specific regional factors and population characteristics. A high rate of strokes observed after TIA in these younger patients emphasizes the critical need to develop specialized prevention strategies along with modified risk assessment systems that better predict stroke outcomes in various patient groups.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRBEC-)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTION

ATEEBA ABRAR (PG TRAINEE)

Conceived the study, collected data, performed initial analysis, and prepared the first draft of the manuscript

KHALID SHER (PROF. HOD)

Supervised the research, provided expert guidance, critically reviewed the manuscript, and approved the final version

MAHEEN FAROOQ (PG TRAINEE)

Assisted in data collection, literature review, and manuscript editing

FATIMA GHULAM MUHAMMAD (PG TRAINEE)

Contributed to data acquisition, interpretation of results, and organization of findings

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LATA DEVI (PG TRAINEE)
Helped in methodology development, patient recruitment, and manuscript formatting
RIZWANA MALAHAT AHMAD (PG TRAINEE)
Contributed to statistical analysis, referencing, and final proofreading of the manuscript

All authors read and approved the final version of the manuscript.

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