

**PROGNOSTIC VALUE OF THE ABCD2 SCORE BEYOND SHORT-TERM FOLLOW-UP  
AFTER TRANSIENT ISCHEMIC ATTACK (TIA)**Nesrin Ebrahim<sup>1\*</sup> and Eisa Layka<sup>2</sup><sup>1</sup>Department of Neurology Diseases, Tishreen University, Faculty of Medicine, Lattakia, Syria.<sup>2</sup>Department of Neurology Diseases, Professor, Tishreen University, Faculty of Medicine, Lattakia, Syria.

\*Corresponding Author: Nesrin Ebrahim

Department of Neurology Diseases, Tishreen University, Faculty of Medicine, Lattakia, Syria.

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**ABSTRACT**

**Background:** Transient ischemic attacks (TIA) serve as warning signs of future stroke. The research aims to study the prognostic value of the ABCD2 score after short-term follow-up of patients with a transient ischemic attack and their risk of stroke development during the following (2, 7, 90) days. **Results:** This prospective observational study included (265) patients who had a transient ischemic attack and who They visited the emergency department at Tishreen University Hospital and their symptoms had not been present for more than 42 hours. The ABCD2 score was calculated for all patients and a brain scan or MRI was performed within 24 hours for all patients. The patients were followed up after (2-7-90) days to evaluate the incidence of New cerebrovascular accidents, the incidence of stroke was 3.4% after 2 days, 5.3% after 7 days, and 7.2% after 90 days of follow-up. The standard point with the highest sensitivity and specificity for predicting the occurrence of stroke was the ABCD2 value = 5, with a sensitivity of 73.3% and a specificity of 65.1% for prediction. With regard to stroke, with regard to the development of stroke, which was on the rise with increasing values of the ABCD2 index, as the low risk group (0-3) recorded 2.1%, and it rose to 10% in the medium risk group (4-5), and it rose to 67.5% in the high risk group. (6-7), and the mortality rate among the study patients was 1.5%, with 4 cases, as no deaths occurred in the low-risk group, while it was distributed between the two groups with medium risk, at a rate of 0.8%, and in the high-risk group, at a rate of 7.5%, with statistical significance (p -value: 0.005).

**KEYWORDS:** Transient ischemic attacks, ABCD2 score, stroke.**1. INTRODUCTION**

Diagnosing transient ischemic attacks (TIAs) is essential to reduce the risk of subsequent stroke, as this risk can be approximately 20% in the three months following a TIA depending on the mechanism causing the cerebrovascular accident.<sup>[1,2,3,4]</sup> TIAs were defined as transient episodes of focal neurological dysfunction, usually less than 1 hour, and without evidence of acute infarction on computed tomography (CT) or magnetic resonance imaging (MRI).<sup>[5,6]</sup> Thus, the benign connotation of "TIA" was replaced by Because even a relatively short ischemia can cause permanent brain injury. Transient ischemic attacks are caused by decreased blood flow to a localized area of the brain. Symptoms are focal and are also transient when the arterial obstruction is crossed (eg, after embololysis or distal passage of the embolus) or when collateral circulation is unable to restore adequate perfusion to the ischemic area.<sup>[7,8]</sup> Several clinical risk scores have been developed to identify TIA patients with high and low early stroke risk for triaging patients in primary and secondary care. The best validated tool for assessing stroke risk after TIA is the ABCD2 score.<sup>[9,10,11,12]</sup>

**2. METHODS****2.1. Patient Selection**

It is a prospective observational study. The study included transient ischemic attack patients visiting the emergency department at Tishreen University Hospital during the years 2022-2023, and whose symptoms had not been present for more than 24 hours. Patients who were excluded had one of these conditions: patients whose symptoms had been <24 hours, epilepsy, migraine, syncopal attack, brain tumor (primary or secondary), brain abscess, demyelinating lesions, subdural hemorrhage, Todd's palsy (after Convulsive seizures, hypoglycemic seizures, encephalitis, vertigo of peripheral or psychological origin, cardiac arrhythmia, and mechanical compression neuropathies. The patient's clinical history was documented, including age, sex, and the presence of risk factors such as smoking, alcohol consumption, diabetes, hypertension, hyperlipidemia, coronary heart disease, and atrial fibrillation. A comprehensive neurological examination was performed and the onset and duration of symptoms were recorded. The ABCD2 score at the time of admission was calculated as follows: age ( $\geq 60$  years, 1 point); Blood

pressure at first evaluation after TIA (systolic blood pressure (SBP)  $\geq 140$  mmHg or diastolic blood pressure (DBP)  $\geq 90$  mmHg, 1 point); Clinical features of TIA (unilateral weakness, 2 points; speech impairment without weakness, 1 point); Duration of symptoms ( $\geq 60$  minutes, 2 points; 10–59 minutes, 1 point); Diabetes (1 point). According to Johnston *et al.*, the ABCD2 score was divided into three categories ( $\geq 3$  points, low; 4–5 points, moderate; 6–7 points, high). A brain scan was performed for all patients. Patients were followed up after (2–7–90) days to evaluate the occurrence of new cerebrovascular events.

### 2.2. Ethical Consideration

All patients were provided with complete and clear informed consent after the discussion about the study. This study was performed in accordance with the Declaration of Helsinki.

### 2.3. Clinical endpoints

In a short follow-up of 2–7–90 days, all 265 patients were contacted by telephone or mail for evaluation of new vascular events.

The data set was supplemented with information obtained from relatives, treating physicians and/or hospitals.

Our main points of interest were cerebrovascular events (stroke or TIA), and death due to vascular disease or unknown cause.

### 2.4. Statistical Analysis

Statistical analysis was performed using IBM SPSS statistics. Differences between different groups were examined using the chi-square test or Fisher's exact test. One Way Anova test was used to compare mean differences between several independent groups. After testing all the variables according to Univariate regression, the variables with statistical value were entered into the Multivariate analysis equation and the odds ratio (odd ratio OR) was determined to study the risk associated with the development of stroke associated

with a high index value. The results were considered statistically significant with a p-value  $< 5\%$ . A receiver operating characteristic (ROC) curve was generated, and the area under the curve (AUC) where accuracy was high was created when it was between 0.9 – 1.

### 3. RESULTS

The study included (265) patients diagnosed with a transient ischemic attack who visited the emergency department during the time period 2022–2023. Male patients were 165 (62.3%), and female patients were 100 (37.7%) (Figure 1). The age of the patients ranged between 43 and 82 years old. The distribution of categories was ABCD2 is as follows: Low-risk group (0–3) points were 95 patients (35.8%); Intermediate-risk group (4–5) points were 130 patients (49.1%); High-risk group (6–7) points were 40 patients (15.1%) (Table 1). High blood pressure was the most common risk factor, accounting for 66.1% (Table 2). Unilateral weakness was the most common clinical manifestation in the study patients, accounting for 50.6% (Table 3). 40% of patients had a duration of symptoms between 10–59 minutes (Table 4). There was a gradual increase in the rate of stroke development as follow-up periods lengthened (Table 5). We noticed that there were statistically significant differences between the research sample groups with regard to all demographic variables except gender (Table 6). We noticed with regard to the development of stroke that it was increasing with increasing values of the ABCD2 index (Table 8). the number of patients who died was 4, distributed between the medium and high-risk groups, while no deaths occurred in the low-risk group (Table 9). To determine a cut-off point for the ABCD2 score for the purpose of predicting stroke, we performed a ROC curve and obtained a result that reflects the close association between the ABCD2 score and the development of stroke. The standard point with the highest sensitivity and specificity for predicting the occurrence of stroke was ABCD2=5, with a sensitivity of 73.3% and a specificity of 65.1% (Figure 2).

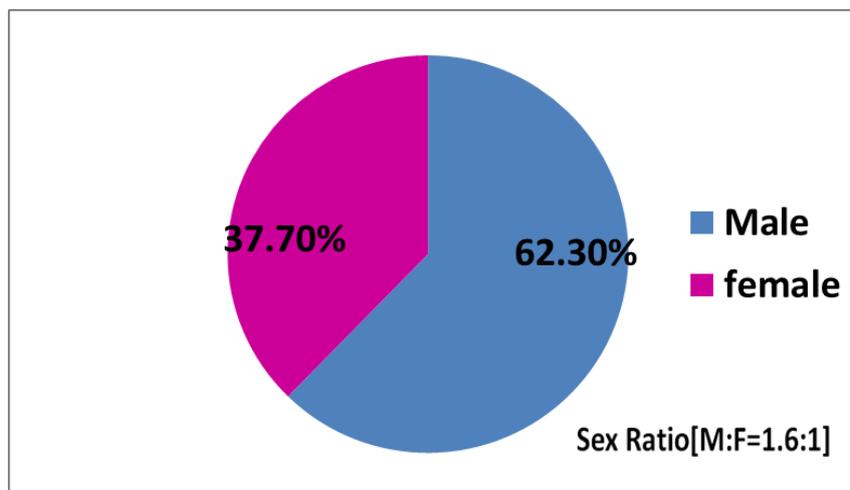


Figure 1: Results of the research sample's distribution by gender.

**Table 1: Distribution of the research sample according to the ABCD2 score.**

ABCD2	the number	Percentage
0-3(Low risk)	95	35.8%
4-5 (Moderate risk)	130	49.1%
6-7 (High risk)	40	15.1%

**Table 2: Results of the distribution of risk factors in patients with transient ischemic attack.**

Risk factors	the number	Percentage
Smoking	134	50.6%
High blood pressure	175	66.1%
Hyperlipidemia	123	46.1%
TIA precedents	115	43.4%
Diabetes	108	40.7%
Coronary heart disease	61	23.1%

**Table 3: Results of the distribution of the research sample according to clinical manifestations.**

Clinical manifestations	the number	Percentage
Unilateral weakness	134	50.6%
Speech disorder	86	32.5%
Other symptoms	45	16.9%

**Table 4: Results of the distribution of the research sample according to the duration of symptoms.**

Period of symptoms	the number	Percentage
m* <10	89	33.6%
m 10-59	106	40%
60 m ≥	70	26.4%

\*m, minute.

**Table 5: Percentage of patients who developed a stroke during follow-up periods.**

Follow-up period (days)	the number	Percentage
2 days	9	3.4%
7 days	14	5.3%
90 days	19	7.2%

**Table 6: Differences in demographic distribution between patient groups.**

Demographic variables	ABCD2=0-3 (n=95)	ABCD2=4-5 (n=130)	ABCD2=6-7 (n=40)	P-value*
Male	55(57.9%)	86(66.2%)	24(60%)	0.5
Females	40(42.1%)	44(33.8%)	16(40%)	
age	58.92±8.9	63.2±10.1	62.9±11.3	0.01
Smoking	36(37.9%)	79(60.8%)	25(62.5%)	0.04
Alcohol	2(2.1%)	13(10%)	5(12.5%)	0.01
BMI**	26.2±2.8	27.9±2.4	29.8±3.4	0.001

*p*-value is significant at the 0.05 level, \*\* BMI: Body mass index. \***Table 7: Differences in the distribution of risk factors for chronic diseases.**

risk factors	ABCD2=0-3 (n=95)	ABCD2=4-5 (n=130)	ABCD2=6-7 (n=40)	P- value
High blood pressure	51(53.7%)	88(67.7%)	36(90%)	0.0001
Hyperlipidemia	37(38.9%)	68(52.3%)	18(45%)	0.8
TIA precedents	31(32.6%)	61(46.9%)	23(57.5%)	0.01
Diabetes	29(30.5%)	57(43.8%)	22(55%)	0.003
Coronary heart disease	18(18.9%)	31(23.8%)	12(30%)	0.4

**Table 8: Results of stroke development among patient groups.**

Stroke development	ABCD2=0-3 (n=95)	ABCD2=4-5 (n=130)	ABCD2=6-7 (n=40)	P- value
Yes	2(2.1%)	13(10%)	27(67.5%)	0.0001
No	93(97.9%)	117(90%)	13(32.5%)	0.0001

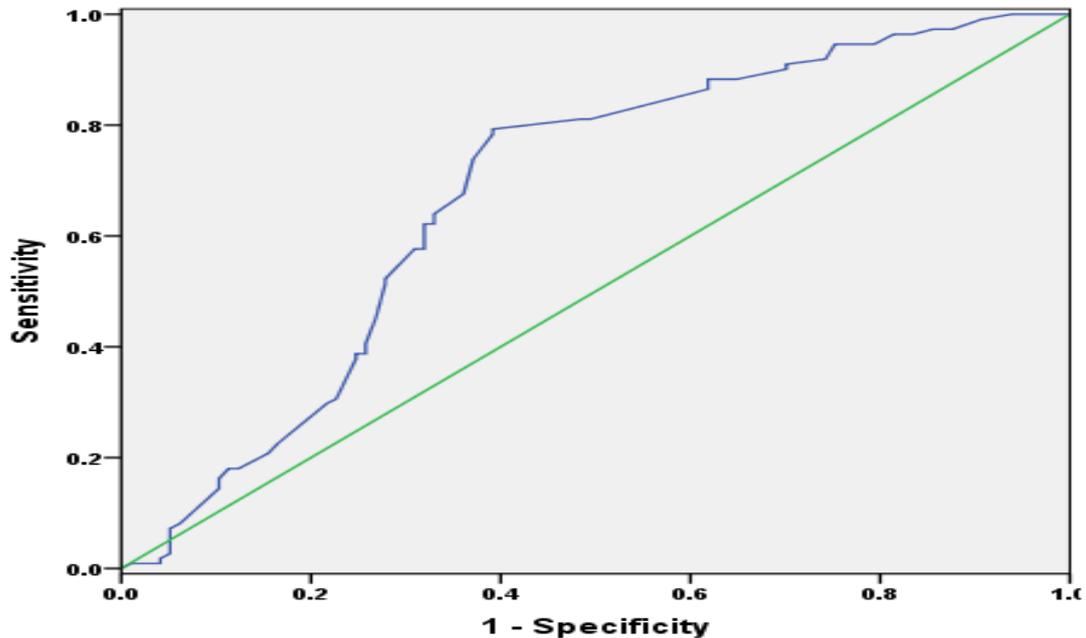
**Table 9: Distribution of deaths among patient groups.**

Death	ABCD2=0-3 (n=95)	ABCD2=4-5 (n=130)	ABCD2=6-7 (n=40)	P- value
Yes	0(0%)	1(0.8%)	3(7.5%)	0.005
No	95(100%)	129(99.2%)	37(92.5%)	0.005

**Table 10: Multivariate analysis of ABCD2.**

Variables	**OR* a [CI95%]	p-value
Stroke development	6.8[1.5-11.2]	0.0001
Death	3.9[2.8-9.9]	0.0001
Diabetes	3.2[1.2-10.5]	0.0001

\*OD, Odds Ratio; \*\* CI, confidence Interval.

**Figure 2: ROC Curve to predict the development of stroke in patients.**

AUC = 0.696 [0.60-0.75]

Sensitivity = 73.3% [62-81]

Specificity= 65.1% [54-72]

off=5 Cut

#### 4. DISCUSSION

The research sample included 265 patients with an average age of (62.94) years. The males were 62.3 % of the patients, which is in line with the fact that the male sex is one of the non-modifiable risk factors in ischemic stroke. Stroke throughout human life is higher in females because the average lifespan of females is higher than the average of males.<sup>[13]</sup> 65.7% were in the age group over 60 years, as the risk of stroke, in its two types, "ischemic and hemorrhagic", doubles every decade after the age of 55.<sup>[14,15]</sup>

High blood pressure was the most common risk factor in the research sample, and this is consistent with international studies, considering high blood pressure is the most common modifiable risk factor in patients with ischemic attack and stroke, both ischemic and hemorrhagic.<sup>[16]</sup> We found that diabetes is an independent risk factor for predicting stroke, and this is not surprising due to the pathological changes it causes at the level of the lining of the vessels and its role in the release of embolism, which indicates the extreme importance of controlling sugar levels to reduce the consequences of stroke.<sup>[17,18,19]</sup> The most common clinical manifestation in the study sample was unilateral

weakness at a rate of 50.6%, and this was accompanied by an increase in the ABCD2 score.

Regarding the duration of symptoms, the period between 10-59 minutes had the largest share among patients, accounting for 40% of the research sample studied. As for the ABCD2 score, the highest percentage was obtained by the group with medium risk (ABCD2=4-5), at 49.1%. We noticed a gradual increase in the rate of stroke development with prolonged follow-up periods, as the rate reached 3.4% after two days, 5.3% after 7 days, and 7.2% after 90 days of follow-up, and this is consistent with international studies. We also noticed with regard to the development of stroke, which was on the rise with increasing values of the ABCD2 index, as the low risk group (0-3) recorded 2.1%, and it rose to 10% in the medium risk group (4-5), and it rose to 67.5% in the high risk group (6-7). High values of the ABCD2 index were associated with:

Advanced age, smoking, alcoholism, high body mass index, high blood pressure, diabetes, and the presence of a history of TIA, and this is in line with international studies, where most of these factors are associated with an increased risk of developing strokes. The death rate in the total research sample was 1.5%, with 4 cases. No

deaths occurred in the low-risk group, while it was distributed between the two medium-risk groups at a rate of 0.8% and in the high-risk group at a rate of 7.5%. By applying the multivariate analysis equation, we found that high ABCD2 values and diabetes were independent risk factors for predicting the occurrence of stroke and death. To determine a cut-off point for the ABCD2 score for the purpose of predicting stroke, we performed a ROC curve and obtained the following results: The standard point with the highest sensitivity and specificity for predicting stroke was ABCD2=5, with a sensitivity of 73.3% and specificity of 65.1% for predicting stroke.

## 5. CONCLUSION

In conclusion, The ABCD2 score is an independent predictive index for predicting stroke following a transient ischemic attack. patients with moderate or high ABCD2 scores are at increased risk of suffering from further vascular events in the short- to medium-term follow-up after TIA. A high ABCD2 score is a risk factor for death following a transient ischemic stroke. Both high blood pressure and diabetes were independent risk factors for stroke.

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