Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol. 14, Issue 15s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Clinical Characteristics and Risk Factors of Ischemic Stroke in A Sample of Young Adults in Beni-Suef Governorate, Egypt

Mustafa Ahmed Mahmoud[1]*, Shaimaa Ali Abd Elkareem[2], Mohammed Mabrouk Masoud[3]

[1]M.B.B. Ch, MSc. Neuropsychiatry

[2]Department of clinical and chemical pathology, Faculty of Medicine, Beni-Suef University

[3]Department of Neurology, Faculty of Medicine, Beni-Suef University

***Corresponding author:**

Mustafa Ahmed Mahmoud

Email ID: Mustafaahmedneuro1@gmail.com

Cite this paper as: Mustafa Ahmed Mahmoud, Shaimaa Ali Abd Elkareem, Mohammed Mabrouk Masoud, (2025) Clinical Characteristics and Risk Factors of Ischemic Stroke in A Sample of Young Adults in Beni-Suef Governorate, Egypt. *Journal of Neonatal Surgery*, 14 (15s), 1994-2000.

ABSTRACT

Background: Ischemic stroke is the most prevalent etiology of mortality and prolonged disability, accounting for more than 80% of all types of strokes.

Aim: To assess clinical features and risk factors of ischemic stroke in a sample of young adults in Beni-Suef Governorate, Egypt.

Patients and methods: This case-control research was performed on 188 subjects divided into 2 groups: 93 Egyptian cases diagnosed with acute ischemic stroke were evaluated when they were admitted to the Neurology Department, Beni-Suef University Hospital (they were enrolled from February 2021 to April 2022) and the control group: included 95 healthy volunteers free of any medical illness from the same geographical region (Beni-Suef governorate). The ischemic stroke cases and the controls were matched concerning age, gender, and socioeconomic status.

Results: This study revealed that 55.9% of cases had a moderate degree of stroke, with 36.6% having a mild degree versus 7.5% with moderate to severe, according to NIHSS score. The mean NIHSS score was 7.65±4.5, and the mean infarction size was 26.3±37.1 ml. Stroke etiologies were determined according to TOAST classification; the most common etiology was atherosclerotic large vessel disease (30.1%), followed by cardioembolic stroke (24.7%).

Conclusion: Our study found insignificant variance in age and sex between the stroke cases and controls. Common risk factors included smoking, dyslipidemia, family history of stroke, diabetes, hypertension, and cardiac illness. Most strokes were moderate in severity, with atherosclerotic large vessel disease and cardioembolic stroke being the most common causes.

Keywords: *Ischemic Stroke, NIHSS score, TOAST classification*

1. INTRODUCTION

Stroke has become a major illness threatening life and health globally and is a major worldwide public health issue to be solved **(1)**. Strokes, generally, may arise from various causes involving modifiable risk factors as exercise, diet, as well as environmental conditions, in addition to non-modifiable risk factors as genetic predisposition, sex, and age. The existence of other comorbidities**, like atrial fibrillation, hypertension, atherosclerosis, and diabetes mellitus, may elevate the possibility of stroke (2).**

Ischemic stroke (IS) is the most common type of stroke (eighty percent of every patient). The accurate identification of IS cause permits tempestive interventions in treatment with the purpose of managing the etiology and avoiding a novel cerebral ischemic event. However, the recognition of the etiology is frequently difficult and is dependent on clinical characteristics and information attained through imaging methods and other diagnostic examinations **(3).**

The frequency of ischemic stroke in young adults has elevated by forty percent in current decades, leading to over two million young cases with stroke yearly. Epidemiological research has shown an elevating proportion of ischemic stroke in young adults, that accounts for ten to twenty percent of all ischemic stroke events **(4).**

Stroke results in young cases are usually favorable, with a great rate of good three-month functional results and with reduced short-term death in comparison with older stroke cases **(5).**

The purpose of this research was to assess clinical features and risk factors of ischemic stroke in a sample of young adults in Beni-Suef Governorate, Egypt.

2. PATIENTS AND METHODS

This case-control research has been performed on 188 subjects divided into 2 groups: 93 Egyptian cases diagnosed with acute ischemic stroke. The patients were evaluated when they were admitted to the Neurology Department, Beni-Suef University Hospital (they were enrolled from February 2021 to April 2022) and the control group: included 95 healthy volunteers free of any medical illness from the same geographical region (Beni-Suef governorate). The ischemic stroke cases and the controls have been matched concerning age, gender, and socioeconomic status.

Inclusion criteria: Cases with 1st ever acute ischemic stroke within 1 week of stroke beginning diagnosed through clinical investigation and imaging (either brain CT or brain MRI); cases aged 18–45 years; the subject's birthplace should be in Egypt, and their ancestors (2 generations) should be Egyptians.

Exclusion criteria: Cases aged above forty-five years or <18 years and cases with ischemic stroke onset > 1 week.

1. Methods:

All cases involved in this research have been exposed to the following: Clinical assessment included **Stroke severity** has been evaluated utilizing the National Institute of Health Stroke Scale (NIHSS) at admission and categorized as follows: minor stroke, 1–4; moderate stroke, 5–15; moderate to severe stroke, 16–20; and severe stroke, 21–42 **(6)**.

Large-artery atherosclerosis: The patient was considered to have large-artery atherosclerosis with clinical and brain imaging outcomes of:

Duplex imaging or arteriography of a stenosis over fifty percent or obstruction of a proper intracranial or extracranial artery, likely because of atherosclerosis. Clinical outcomes involve those of impairment of the cerebral cortex (neglect, aphasia, limited motor involvement, etc.) or cerebellar or brain stem dysfunction. A history of intermittent claudication, transient ischemic attacks (TIAs) in the same vascular territory, a carotid bruit, or reduced pulses aids support the clinical identification. Lesions of the cortex or cerebellum and brain stem or subcortical hemispheric infarcts over 1.5 centimeters in diameter on magnetic resonance imaging or computed tomography are regarded as potentially originating from large-artery atherosclerosis. Diagnostic research must exclude possible sources of cardiogenic embolism.

Cardioembolism: Patients were considered to have cardioembolic stroke with:

Arterial obstructions likely because of an embolus originating from the heart. A minimum of 1 cardiac source for an embolus should be recognized for a probable or possible identification of cardioembolic stroke. Cardiac sources are separated into medium-risk and high-risk groups. Clinical and brain imaging outcomes are comparable to those defined for large-artery atherosclerosis. Proof of an earlier TIA or stroke in more than 1 vascular territory or systemic embolism supports clinical identification of cardiogenic stroke. Probable large-artery atherosclerotic sources of embolism or thrombosis should be removed.

Small-artery occlusion (lacune): Patients were considered to have lacunar stroke with one of the classic clinical lacunar syndromes and shouldn't have had proof of dysfunction of the cerebral cortex. A history of hypertension or DM supports the clinical identification. The case must additionally have a usual magnetic resonance imaging or computed tomography investigation, or a related brain stem or lesion of the subcortical hemisphere with a diameter below 1.5 centimeters shown. Possible cardiac sources for embolism must be absent, and assessment of the large extracranial arteries shouldn't show a stenosis over fifty percent in an ipsilateral artery.

Acute stroke of other determined etiology: Cases were considered with acute stroke of other determined cause with uncommon etiologies of stroke, like hypercoagulable states, nonatherosclerotic vasculopathies, or hematologic illnesses. Cases in this group must have clinical and magnetic resonance imaging or computed tomography outcomes of an acute IS, despite of site or size. Diagnostic research like blood examinations or arteriography must show one of these uncommon etiologies of stroke. Cardiac sources of large-artery atherosclerosis and embolism must be excluded through other research.

Stroke of undetermined etiology. In patients with unknown etiology or with two etiologies (**7).**

3. RESULTS

Table 1 Comparative analysis of general characteristics in various examine groups

Variables	Cases (Number=93)		Control (Number=95)		P-value	Sig.
Age (years)						
Mean ± SD	37.6±8.1		36.6±7.01		0.37	NS
Sex						
Female	45	48.4%	50	52.6%	0.66	NS
Male	48	51.6%	45	47.4%		

SD, Standard Deviation; NS, Non-Significant; P-value, Probability Value; Sig, Significance.

A statistically insignificant variance (P-value above 0.05 among patients and control groups concerning gender and age distribution) as illustrated in Table 1

Table 2 Description of smoking habits among cases

Variables (n=93)	Frequency	
	Number	%
Smoking		
No	61	65.6%
Yes	32	34.4%
Type of smoking		
Cigarettes	29	90.6%
Shisha	3	9.4%
Duration of smoking		
Mean± SD	19.6±7.3	
Range	1-30	
Cigarette number per day		
Mean SD	19.5±8.6	
Range	5-40	

Thirty-four percent of cases were smokers with a mean smoking duration of 19.6±7.3 years. The mean number of cigarettes per day was 19.5±8.6 (Table 2).

Table 3 Frequency of medical history among cases

Variables (n=93)	Frequency	
	Number	%
DM		

No	69	74.2%
Yes	24	25.8%
HTN		
No	58	62.5%
Yes	35	37.6%
Contraception		
No	68	73.1%
Yes	25	26.9%
Dyslipidemia		
No	55	59.1%
Yes	38	40.9%
Drug abuse		
No	87	93.5%
Yes	6	6.5%
Cardiac disease		
No	71	76.3%
Yes	22	23.7%
IHD		
No	88	94.6%
Yes	5	5.4%
AF		
No	74	79.6%
Yes	19	20.4%
Prosthetic valve		
No	87	93.5%
Yes	6	6.5%
HF		
No	93	100%
Yes	0	0%
Stroke family history		
Negative	53	57%
Positive	40	43%

As a stroke risk factor, 43% of cases showed a positive family history of ischemic stroke, 40.9% of cases were dyslipidemic, 37.6% had hypertension, 25.8% of cases had DM, and 23.7% of cases had cardiac disease (Table 3).

Table 4. Stroke severity among cases assessed by NIHSS.

Variables (n=93)	Frequency	
	Number	%
Stroke severity		
Mild	34	36.6%
Moderate	52	55.9%
Moderate to severe	7	7.5%
NIHSS score	**Mean± SD**	**Range**
NIHSS score	7.65±4.5	1-18

This study revealed that 55.9% of cases had a moderate degree of stroke, with 36.6% having a mild degree versus 7.5% with moderate to severe, according to NIHSS score. The mean NIHSS score was 7.65±4.5, and the mean infarction size was 26.3±37.1 ml. (Table 4)

Table 5. Stroke etiology according to TOAST classification.

Variables (n=93)	Frequency	
	Number	%
Etiology		
Small vessel	15	16.1%
Large vessel	28	30.1%
Cardio-embolic stroke	23	24.7%
Other determined	6	6.5%
Undermined	21	22.6%

Stroke etiologies were determined according to TOAST classification; the most common etiology was atherosclerotic large vessel disease (30.1%), followed by cardioembolic stroke (24.7%). Small vessel disease was found to affect 16.1% of patients, while 6.5% of patients had other determined etiologies. About 22.6% of patients were of undetermined causes (Table 5).

4. DISCUSSION

Our results showed a statistically insignificant variance (P-value above 0.05 among patients and control groups concerning gender and age distribution).

In agreement with our results, **Gökçal et al. (8)** compared the variances in subtype categorization between CCS, ASCO, and TOAST in young stroke cases. A total of 151 cases participated in the study: 55 (36.4%) were women and 96 (63.6%) were men, with a mean age of 41.6 ± 6.6 years.

Our results indicated that thirty-four percent of cases were smokers with a mean smoking duration of 19.6±7.3 years. The mean number of cigarettes per day was 19.5±8.6.

According to **Gökçal et al.** (8), they found that 42.4% of cases were smokers. Furthermore, **Meza et al. (7)** documented that 51.4% of cases were smokers.

As well, **Kono et al. (10)** evaluated the risk factors, cause, and results of ischemic stroke in young adults. They found that 34% of patients were smokers. In addition, **Ghoreishi et al. (11)** reported that 13.5% were smokers.

Our results showed that 43% of cases showed a positive family history of ischemic stroke, 40.9% of cases were dyslipidemic, 37.6% had hypertension, 25.8% of cases had DM, and 23.7% of cases had cardiac disease.

In agreement with our results, **Meza et al. (9)** aimed to define the occurrence of various vascular risk factors and the etiology and features of ischemic stroke in young adults. A total of 786 patients were found to that 266 (33.8%) with arterial

hypertension, 103 (13.1%) with diabetes mellitus, 273 (34.7%) with dyslipidemia, 71 (9%) with a history of stroke, and 18 (2.3%) with a history of coronary artery illness.

In the study of **Kono et al. (10),** a total of 159 patients their age ≤ 44, they reported that 64 (41%) had hypertension, 16 (10%) had diabetes mellitus, 57 (36%) had dyslipidemia, and 18 (4%) had coronary heart disease.

As well, **Gökçal et al.** (8) found that among 151 patients, 60 (39.7%) patients had hypertension, 24 (15.9%) patients had diabetes mellitus, and 3 (2%) patients had coronary or peripheral artery disease.

Our results showed that 55.9% of cases had a moderate degree of stroke, with 36.6% having a mild degree versus 7.5% with moderate to severe, according to NIHSS score. The mean NIHSS score was 7.65±4.5, and the mean infarction size was 26.3±37.1 ml.

The study was conducted by **Si et al. (12),** who aimed to present the clinical features of etiological and risk factors of ischemic stroke in young adults to give reference to early avoidance and treatment. Among 40 cases, their age ranged from 18 to 34 years. They found that 80.0% of cases had a mild degree of stroke, with 12.5% having a moderate degree versus 7.5% with a severe degree, according to the NIHSS score.

According to **Kono et al.** (10), they found that the mean NIHSS was 4.0 ± 0.5.

Our results indicated that the most common etiology was atherosclerotic large vessel disease (30.1%), followed by cardioembolic stroke (24.7%). Small vessel disease was found to affect 16.1% of patients, while 6.5% of patients had other determined etiologies. About 22.6% of patients were of undetermined causes.

The study conducted by **Gökçal et al. (8)** represented etiological categorizations through a categorization system. Depending on TOAST categorization, 62 (41.1%) cases have been categorized as undetermined cause, 29 (19.2%) as cardioembolic, 20 (13.2%) as large artery illness, 17 (11.3%) as small vessel illness, and 23 (15.2%) as other etiologies.

As well, **Meza et al.** (9), regarding TOAST classification, reported that 8 (8.8%) were classified as large artery illness, 163 (21.2%) as small vessel illness, 55 (7.2%) as cardio-embolism, 204 (26.5%) as stroke of other determined cause, and 279 (36.3%) as stroke of undetermined cause.

Also, **Kono et al. (10)** reported that 15 (10%) were classified as large artery arteriosclerosis disease (LAA), 39 (25%) as small vessel disease (SVD), 13 (8%) as cardio-embolism (CE), 58 (37%) as other determined etiology, and 20 (13%) as undetermined etiology.

5. CONCLUSION

In conclusion, our study found insignificant variance in sex and age among the stroke cases and controls. Common risk factors included smoking, dyslipidemia, family history of stroke, diabetes, hypertension, and cardiac illness. Most strokes were moderate in severity, with atherosclerotic large vessel disease and cardioembolic stroke being the most common causes. A notable proportion of cases had an undetermined etiology, suggesting a need for further investigation into unknown causes of ischemic stroke.

REFERENCES

[1] Wu X, Zou Y, You S, Zhang Y. Distribution of risk factors of ischemic stroke in Chinese young adults and its correlation with prognosis. BMC Neurol. 2022;22(1):26.

[2] Thomas SE, Plumber N, Venkatapathappa P, Gorantla V. A review of risk factors and predictors for hemorrhagic transformation in patients with acute ischemic stroke. Int J Vasc Med. 2021;2021(1):4244267.

[3] Miceli G, Basso MG, Rizzo G, Pintus C, Cocciola E, Pennacchio AR, Tuttolomondo A. Artificial intelligence in acute ischemic stroke subtypes according to toast classification: a comprehensive narrative review. Biomedicines. 2023;11(4):1138.

[4] Tang M, Han G, Yao M, Peng B, Zhu Y, Zhou L, Ni J. Risk factors of ischemic stroke in young adults: a Chinese single-center study. Front Neurol. 2022; 13:874770.

[5] Gurková E, Štureková L, Mandysová P, Šaňák D. Factors affecting the quality of life after ischemic stroke in young adults: a scoping review. Health Qual Life Outcomes. 2023;21(1):4.

[6] Soliman RH, Oraby MI, Fathy M, Essam AM. Risk factors of acute ischemic stroke in patients presented to Beni-Suef University Hospital: prevalence and relation to stroke severity at presentation. The Egyptian journal of neurology, psychiatry and neurosurgery. 2018 Dec; 54:1-9.

[7] Adams Jr HP, Bendixen BH, Kappelle LJ, Biller J, Love BB, Gordon DL, Marsh 3rd EE. Classification of subtype of acute ischemic stroke. Definitions for use in a multicenter clinical trial. TOAST. Trial of Org 10172 in Acute Stroke Treatment. stroke. 1993 Jan;24(1):35-41.

[8] Gökçal E, Niftaliyev E, Asil T. Etiological classification of ischemic stroke in young patients: a comparative study of TOAST, CCS, and ASCO. Acta Neurol Belg. 2017;117(3):643–8.

[9] Meza HT, Roy JA, Lázaro CP, Cardiel MB, González OA, Juste CT, Quintana NH, Lahoz LJ, Muñoz AG, Morer IC. Epidemiology and characteristics of ischaemic stroke in young adults in Aragon. Neurol (English Ed. 2022;37(6):434–40.

[10] Kono Y, Terasawa Y, Sakai K, Iguchi Y, Nishiyama Y, Nito C, Suda S, Kimura K, Kanzawa T, Imafuku I. Risk factors, etiology, and outcome of ischemic stroke in young adults: a Japanese multicenter prospective study. J Neurol Sci. 2020; 417:117068.

[11] Ghoreishi A, Ahani M, Asgari M, Mousavi F, Nasiri H. Comparative analysis of risk factors and clinical outcomes in young patients with acute ischemic and hemorrhagic stroke. Discov Med. 2024;1(1):99.

[12] Si Y, Xiang S, Zhang Y, Lu T, Guo J, Xiao X, Dong L. Clinical profile of aetiological and risk factors of young adults with ischemic stroke in West China. Clin Neurol Neurosurg. 2020; 193:105753.