Cureus

Open Access Original Article

DOI: 10.7759/cureus.43752

Clinical Characteristics of Ischemic Stroke Patients <50 Years Old at a University Hospital: A Retrospective Descriptive Study

Review began 08/08/2023
Review ended 08/16/2023
Published 08/19/2023

Abdullah Alkutbi [1, 2] , Saleh Binmahfooz [2, 1] , Rawan H. AlSaidlani [3] , Rasana B. Albeirouti [1] , Omar Kamal [1] , Hassan Alalawi [1] , Mohammed N. Aljehani [1] , Mohsin Khared [1] , Omar A. Ayoub [1]

1. Department of Internal Medicine, King Abdulaziz University Faculty of Medicine, Jeddah, SAU 2. Department of Internal Medicine, King Abdulaziz University Hospital, Jeddah, SAU 3. Deparmtent of Internal Medicine, King Abdulaziz University Faculty of Medicine, Jeddah, SAU

Corresponding author: Abdullah Alkutbi, aalkutbi@kau.edu.sa

Abstract

Background

Stroke is a leading cause of mortality and disability around the world. It is responsible for 10% of all fatalities and about 5% of all disabilities. Risk factors include age, hypertension (HTN), dyslipidemia, and atrial fibrillation. The incidence of acute ischemic stroke (AIS) is increasing among young adults compared to older ones. It has a direct impact on their quality of life and working activities while also burdening the healthcare system.

Aim

The aim of this study is to investigate the possible risk factors for ischemic stroke in patients who are under 50 years old.

Methods

This is a single-center retrospective record review of patients with ischemic stroke from 2010 to 2022. Eighty patients who had an ischemic stroke at an age below 50 were included in the analysis. Patients above or equal to 50 years old who had ischemic stroke and all patients with hemorrhagic stroke were excluded. Baseline characteristics, length of hospitalization, and in-hospital mortality were compared with different comorbidities.

Results

The mean age was 36.65 among males and females who had an ischemic stroke. 56.8% of them were non-Saudi, while 43.2% were Saudis. Diabetes, hypertension, and dyslipidemia were among the most frequent comorbidities among patients who had ischemic stroke, with a percentage of 82.7%. Other comorbidities, such as autoimmune disease, thrombophilia, and heart failure, were present.

Conclusion

There are different comorbidities found in patients who have had an ischemic stroke and are under 50 years old. However, diabetes and hypertension remain the most common risk factors.

Categories: Internal Medicine, Neurology
Keywords: hypertension, diabetes mellitus, young adult, risk factors, acute ischemic stroke

Introduction

Stroke is the leading cause of mortality and disability worldwide. It accounts for 10% of all fatalities and approximately 5% of all disabilities [1]. Stroke is predicted to be the main cause of the loss of healthy life years due to the aging of the global population [2]. Risk factors for stroke include age, hypertension (HTN), dyslipidemia, and atrial fibrillation. In Saudi Arabia, the incidence rate of all strokes varies from 175.8 to 196.2 per 100,000 individuals, whereas the rate of intracerebral hemorrhage varies from 39.7 to 48.6 per 100,000 individuals. In addition, the incidence rates for acute ischemic stroke (AIS) range from 131.0 to 151.5 [3]. Another study in China showed that ischemic stroke accounts for 79.1% of all stroke types [4-6]. There are significant numbers of ischemic strokes that occur in young patients [7], who have distinct risk factors compared to older patients [8]. Possible risk factors were addressed in a large study done in Europe in 2012 that included 3944 patients with a median age of 43 years and concluded that the most common risk factors among young individuals were smoking (49%), dyslipidemia (46%), and HTN (36%) [9]. In contrast, a study in Japan in 2022 revealed that dyslipidemia, HTN, and diabetes mellitus (DM) were less frequent among young patients experiencing ischemic stroke. Moreover, smoking, alcohol consumption, and obesity

were more frequent risk factors for young individuals [10]. AIS among young adults has a huge impact on the quality of life, such as the loss of the ability to work and a significant burden on the healthcare system [11-13]. Therefore, effective primary and secondary prevention measures for young individuals will have a huge impact on their quality of life [9]. A small number of studies that focus on young adults have been published in the literature, and most of them were single-center cohorts [9]. Therefore, the insufficient number of studies addressing young populations with AIS and related risk factors makes it an important area of research. This study aimed to investigate the possible risk factors for AIS in patients aged <50 years at King Abdulaziz University Hospital, Jeddah, Saudi Arabia.

Materials And Methods

Sample description

In this study, we aimed to identify risk factors in young patients diagnosed with AIS at King Abdulaziz University Hospital, a tertiary care center, teaching hospital, and referral hospital in the city of Jeddah, Saudi Arabia.

We conducted a retrospective cross-sectional study wherein we reviewed the medical records of inpatients, outpatients, intensive care units, and emergency medicine departments, searching for patients with a clinical diagnosis of ischemic stroke, either first-time AIS or recurrent AIS, between 2010 and 2022. Eighty-one patients under 50 years old with ischemic stroke were included, excluding those with hemorrhagic stroke or over 49 years old. Most were of Middle Eastern descent.

Risk factors

We investigated the baseline characteristics of the patients, including demographics, history of smoking, and comorbidities. The definitions of risk factors were as follows: diabetes mellitus (fasting blood glucose concentration ⩾7.0 mmol/L, positive 75-g oral glucose tolerance test, or glycated hemoglobin A1c concentration of 6.5%), hypertension (systolic blood pressure of ⩾140 mmHg or diastolic blood pressure of ⩾90 mmHg), dyslipidemia (elevated total or low-density lipoprotein [LDL] cholesterol levels, or low levels of high-density lipoprotein [HDL] cholesterol), smoking (current or former cigarette smoker), thrombophilia (a blood disorder that makes the blood in veins and arteries more likely to clot known as "hypercoagulable state"), autoimmune disease (a disease of which the body immune system responds to a functioning body part).

Ethics statement

The Research Ethics Committee NCBE registration (No. HA-02-J-008) at King Abdulaziz University reviewed and approved our research proposal with ethical approval (reference No. 556-22). The requirement for consent was waived due to the retrospective nature of the study.

Data collection

Clinical data were obtained from the hospital record, which included demographic data, smoking history, length of hospitalization in the setting of AIS, in-hospital death, and comorbidities that included multiple chronic diseases such as diabetes mellitus (DM), HTN, dyslipidemia, and acute coronary syndrome.

Data entry and statistical analysis

Data entry was performed using Google Sheets and then transferred to Excel version 16.70. We analyzed the data using IBM SPSS Statistics for Windows version 21. Means ± standard deviations were calculated for age, length of hospitalization, and scaled data. Additionally, we calculated the frequencies and percentages for the categorical data. We used the Chi-square test to determine the relationship between comorbidities and in-hospital mortality. The t-test was used to compare the length of hospitalization and comorbidities. Statistical significance was considered when the P-value was equal to or less than 0.05.

Results

Baseline characteristics

Eighty-one patients were included in the study. A total of 52 (64.2%) patients were female, and 29 (35.8%) were male. The mean age of the patients was 36.65 ± 12.47 years. Regarding nationality, 46 (56.8%) patients were non-Saudi, and 35 (43.2%) were Saudi. The most common comorbidities were HTN and DM. Table *1* summarizes baseline patient characteristics.

Comorbidity	No	Yes	P-value
Diabetes mellitus	7.94 ± 13.36	15.67 ± 23.51	0.063
Hypertension	8.32 ± 13.40	14.68 ± 23.43	0.124
Dyslipidemia	11.19 ± 18.68	6.67 ± 9.42	0.416
Coronary artery disease	9.12 ± 13.05	28 ± 45.44	0.356
Acute coronary syndrome	9.21 ± 12.99	30.40 ± 50.38	0.401
Congenital heart disease	10.43 ± 17.95	12.25 ± 11.79	0.842
Autoimmune disease	10.78 ± 18.01	5.50 ± 6.80	0.236
Thrombophilia	11.71 ± 18.69	2.91 ± 2.77	0.125
Cerebral venous thrombosis	10.97 ± 18.07	3.60 ± 6.50	0.369
Seizure disorder	10.91 ± 18.00	3.00 ± 2.94	0.385
Heart failure	10.84 ± 18.42	7.63 ± 7.50	0.628
Chronic kidney disease	10.76 ± 17.93	4.33 ± 3.51	0.539
Hyperthyroidism	10.63 ± 17.23	6.00 ± 8.49	0.716
Hypothyroidism	10.76 ± 17.93	4.33 ± 4.51	0.539

TABLE 1: Length of hospitalization for patients with different comorbidities

Length of hospitalization

The mean length of hospitalization for male patients was 14.55 ± 26.89 days compared to 8.27 ± 8.77 days for female patients; the difference was not statistically significant (P=0.231). The mean length of hospitalization for patients with no prior history of smoking was 10.75 ± 18.17 days compared to 7.00 ± 4.18 days for patients with a positive history of smoking, without a significant difference (P=0.648). Table *2* and Figure *1* demonstrate a comparison of the mean length of hospitalization between patients with different comorbidities.

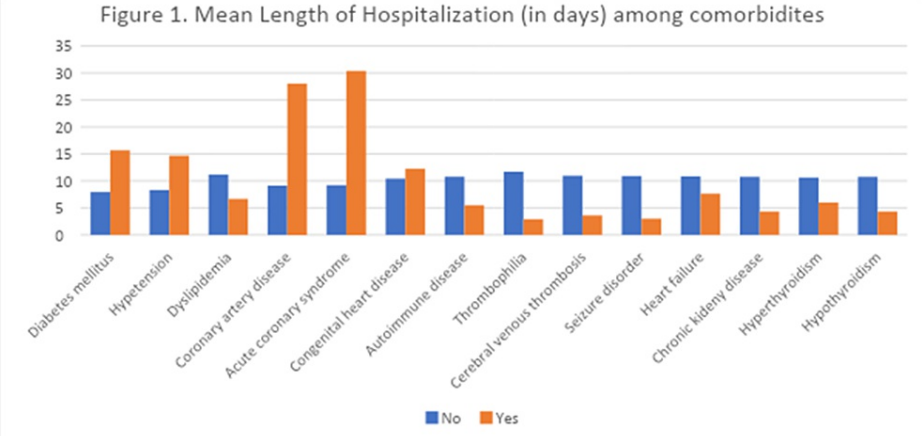

FIGURE 1: Mean length of hospitalization (in days) among comorbidities

Comorbidity	No in-hospital mortality	In-hospital mortality	P-value
Diabetes mellitus	20	7	0.363
Hypertension	23	5	1.000
Dyslipidemia	12	0	0.110
Coronary artery disease	5	1	1.000
Acute coronary syndrome	4	1	1.000
Congenital heart disease	4	0	1.000
Autoimmune disease	3	1	0.567
Thrombophilia	11	0	0.203
Cerebral venous thrombosis	5	0	0.578
Seizure disorder	4	0	1.000
Heart failure	6	2	0.637
Chronic kidney disease	2	1	0.464
Hyperthyroidism	1	1	0.338
Hypothyroidism	2	1	0.464

TABLE 2: In-hospital mortality for patients with different comorbidities

In-hospital mortality

During their hospitalization, 18.5% of patients experienced in-hospital mortality, of whom six (7.4%) were males and nine (11.11%) were females. Among patients with a history of smoking, two (2.47%) experienced in-hospital mortality, whereas three (3.70%) did not. All of which showed no statistical significance. Table *3* shows a comparison between patients with different comorbidities regarding in-hospital mortality.

Characteristics	Results
Age (mean ± SD)	36.65 ± 12.47
Gender (n, %)	
Male	29 (35.8%)
Female	52 (64.2%)
Nationality (n, %)	
Saudi	35 (43.2%)
Non-Saudi	46 (56.8%)
Length of hospitalization* (mean ± SD)	10.52 ± 17.65
History of smoking (n, %)	5 (6.2%)
Comorbidities (n, %)	
Diabetes mellitus	27 (33.3%)
Hypertension	28 (34.6%)
Dyslipidemia	12 (14.8%)
Coronary artery disease	6 (7.4%)
Acute coronary syndrome	5 (6.2%)
Atrial fibrillation	1 (1.2%)
Congenital heart disease	4 (4.9%)
Heart failure	8 (9.9%)
Autoimmune disease	4 (4.9%)
Thrombophilia	11 (13.6%)
Sickle cell anemia	1 (1.2%)
Cerebral venous thrombosis	5 (6.2%)
Seizure disorder	4 (4.9%)
Malignancy	1 (1.2%)
Chronic kidney disease	3 (3.7%)
Hyperthyroidism	2 (2.5%)
Hypothyroidism	3 (3.7%)
Previous history of stroke or TIA (n, %)	7 (8.6%)

TABLE 3: Baseline characteristics

*Length of hospitalization in days

Discussion

Baseline characteristics

The average age of the participants in our study was 36.65 years. This was slightly higher than the mean age of 30.1 years reported in a local study by Alamei et al. [14] and lower than the mean age of 37 years reported in a study of Chinese patients [15]. This indicates that younger people are more likely to experience strokes. Additionally, they may be more likely to engage in risky behaviors, such as smoking, that can lead to strokes.

We found that 64.2% of the patients were female. This was comparable to the findings of a regional study in which 66.5% of study participants were female [14]. A study conducted in Riyadh, on the other hand,

reported a majority of male patients (68.2%) [16]. According to these data, young women have a higher risk of stroke than men, which can be attributed to a combination of biological and lifestyle factors. For example, women are more likely to have HTN, DM, and obesity, all of which increase the risk of stroke.

According to our findings, HTN and DM were the most common comorbidities among the patients. This finding is consistent with those of previous studies published in the literature [15,17]. Hypothetically, HTN and DM come with other metabolic disorders such as obesity and hypercholesterolemia, which further increase the risk of stroke [7]. HTN and DM are among the modifiable risk factors for stroke; therefore, it is crucial for individuals with HTN and DM to prioritize the management of their blood pressure and glucose levels to minimize the risk of stroke and its detrimental consequences [7,11].

Length of hospitalization

Our study included 81 patients with ischemic stroke and investigated their length of hospital stay and the factors that contributed to it. The results showed no positive correlation between the length of hospitalization and comorbidities. The most common comorbidity in our population was DM, followed by HTN; they were associated with an average of 20 days of hospitalization. However, there was no statistically significant correlation between variables and the duration of hospitalization. Similarly, in previous studies, DM and HTN were not associated with extended hospital stays of more than seven days, which might indicate that comorbidities are not contributing factors to hospitalization duration [18,19]. Since comorbidities have not been linked to a longer hospital stay in our study, perhaps other factors like the type and severity of stroke would play a role in the length of hospitalization. The study by Hakim et al. showed that shorter hospital stays were linked to stroke types that did not involve the total anterior circulation [20]. Furthermore, a study in Peru stated that a longer length of stay was associated with hemorrhagic strokes rather than ischemic or other types [21]. We believe that proper control of comorbidities during hospitalization is crucial. Still, it is also very important to investigate and control the other factors that prolong a patient's stay in the hospital.

In-hospital mortality

This study revealed factors responsible for in-hospital mortality in selected cases. We observed that 15 (18.5%) patients died during their hospital stay, of whom six (7.4%) were males and nine (11.11%) were females. Five (6.17%) patients had a positive history of smoking, of whom two (2.47%) died and three (3.70%) did not. Possible causes of mortality were analysed, and two conditions were found to have a significant impact on mortality: DM and HTN. Seven of the deceased patients had DM, and five had HTN. Among the other patients who died, one had CAD and one had acute coronary syndrome. Three patients had end-organ diseases, two had thyroid gland disorders, and one had an autoimmune disease. A 2018 meta-analysis that reviewed 66 eligible articles revealed that hyperglycemia and DM were correlated with an overall poor stroke outcome, including higher mortality and readmission rates, longer hospital stays, and recurrences [22]. We hypothesize that mortality in stroke patients with long-standing conditions similar to DM and HTN may be due to the overall exhaustion of patients suffering from comorbidities. This might eventually lead to an overall decrease in patient tolerance and, therefore, an increased risk of mortality.

In the present study, we sought to evaluate different risk factors associated with AIS in the population younger than 50 years; however, there was a limitation of missing data in our hospital; therefore, a multicenter study is needed to access a larger population with more diverse data. Furthermore, appropriate documentation of comorbid conditions and risks would greatly aid subsequent research.

Conclusions

Based on our retrospective study, it was found that patients under the age of 50 who had AIS were often linked to various comorbidities. However, the most common risk factors found in the study were DM and HTN. To obtain a more conclusive result, further studies should be conducted in larger institutions and teaching hospitals.

Additional Information

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. Research Ethics Committee NCBE registration at King Abdulaziz University issued approval HA-02-J-008. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

Authors' contributions: The research project was initiated by Abdullah Alkutbi (AK), who also provided support in designing the study and writing the proposal. Saleh Binmahfooz (SB) assisted in reviewing the manuscript, gathering data, and writing the introduction. Rawan H. AlSaidlani (RS) contributed to the manuscript review, data collection, and methodology writing. Hassan Alalawi (HA) helped with the acquisition and interpretation of data, as well as the manuscript review. Rasana B. Albeirouti (RB) provided support in the manuscript review, data collection, and writing the discussion. Mohammed N. Aljehani (MA) contributed to the discussion and data collection. Omar Kamal (OK) assisted with data collection, methodology, and discussion. Mohsin Khared (MK) aided in the manuscript review and data collection. Finally, Omar A. Ayoub (OA) provided support in reviewing the manuscript. Availability of data and materials: All data generated or analyzed during this study are available upon request from the corresponding author, Abdullah Alkutbi (aalkutbi@kau.edu.sa).

References

1. Global, regional, and national disability-adjusted life-years (DALYs) for 315 diseases and injuries and healthy life expectancy (HALE), 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet. 2016, 388:1603-58. 10.1016/S0140-6736(16)31460-X
2. Jones SP, Jenkinson AJ, Leathley MJ, Watkins CL: Stroke knowledge and awareness: an integrative review of the evidence. Age Ageing. 2010, 39:11-22. 10.1093/ageing/afp196
3. Global, regional, and national burden of stroke and its risk factors, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet Neurol. 2021, 20:795-820. 10.1016/S1474-4422(21)00252-0
4. Global, regional, and national burden of stroke, 1990-2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. 2019, 18:439-58. 10.1016/S1474-4422(19)30034-1
5. Feigin VL, Nguyen G, Cercy K, et al.: Global, regional, and country-specific lifetime risks of stroke, 1990 and 2016. N Engl J Med. 2018, 379:2429-37. 10.1056/NEJMoa1804492
6. Chen H, Shi L, Wang N, et al.: Analysis on geographic variations in hospital deaths and endovascular therapy in ischaemic stroke patients: an observational cross-sectional study in China. BMJ Open. 2019, 9:e029079. 10.1136/bmjopen-2019-029079
7. Grau AJ, Weimar C, Buggle F, et al.: Risk factors, outcome, and treatment in subtypes of ischemic stroke: the German stroke data bank. Stroke. 2001, 32:2559-66. 10.1161/hs1101.098524
8. Naess H, Waje-Andreassen U, Thomassen L, Nyland H, Myhr KM: Health-related quality of life among young adults with ischemic stroke on long-term follow-up. Stroke. 2006, 37:1232-6. 10.1161/01.STR.0000217652.42273.02
9. Putaala J, Yesilot N, Waje-Andreassen U, et al.: Demographic and geographic vascular risk factor differences in European young adults with ischemic stroke: the 15 cities young stroke study. Stroke. 2012, 43:2624-30. 10.1161/STROKEAHA.112.662866
10. Ohya Y, Matsuo R, Sato N, et al.: Causes of ischemic stroke in young adults versus non-young adults: a multicenter hospital-based observational study. PLoS One. 2022, 17:e0268481. 10.1371/journal.pone.0268481
11. Ekker MS, Boot EM, Singhal AB, et al.: Epidemiology, aetiology, and management of ischaemic stroke in young adults. Lancet Neurol. 2018, 17:790-801. 10.1016/s1474-4422(18)30233-3
12. Bhatt N, Malik AM, Chaturvedi S: Stroke in young adults: five new things . Neurol Clin Pract. 2018, 8:501-6. 10.1212/CPJ.0000000000000522
13. Khan SU, Khan MZ, Khan MU, et al.: Clinical and economic burden of stroke among young, midlife, and older adults in the United States, 2002-2017. Mayo Clin Proc Innov Qual Outcomes. 2021, 5:431-41. 10.1016/j.mayocpiqo.2021.01.015
14. Alamri R, Alhazzani A, Alqahtani SA, Al-Alfard H, Mukhtar S, Alshahrany K, Asiri F: Preference and values of stroke interventions, Kingdom of Saudi Arabia. Neurol Res Int. 2019, 2019:8502758. 10.1155/2019/8502758
15. Liu Y, Liu X, Jia J, Guo J, Li G, Zhao X: Uric acid and clinical outcomes in young patients with ischemic stroke. Neuropsychiatr Dis Treat. 2022, 18:2219-28. 10.2147/NDT.S373493
16. Alotaibi N, Aldriweesh MA, Alhasson MA, et al.: Clinical characteristics and outcomes of ischemic stroke patients during Ramadan vs. non-Ramadan months: Is there a difference?. Front Neurol. 2022, 13:925764. 10.3389/fneur.2022.925764
17. Alghamdi SA, Aldriweesh MA, Al Bdah BA, et al.: Stroke seasonality and weather Association in a Middle East country: a single tertiary center experience. Front Neurol. 2021, 12:707420. 10.3389/fneur.2021.707420
18. Mohamed W, Bhattacharya P, Shankar L, Chaturvedi S, Madhavan R: Which comorbidities and complications predict ischemic stroke recovery and length of stay?. Neurologist. 2015, 20:27-32. 10.1097/NRL.0000000000000040
19. Qureshi AI, Adil MM, Zacharatos H, Suri MF: Factors associated with length of hospitalization in patients admitted with transient ischemic attack in United States. Stroke. 2013, 44:1601-5. 10.1161/STROKEAHA.111.000590
20. Hakim EA, Bakheit AM: A study of the factors which influence the length of hospital stay of stroke patients . Clin Rehabil. 1998, 12:151-6. 10.1191/026921598676265330
21. Labán-Seminario LM, Carrillo-Larco RM, Bernabé-Ortiz A: Stroke-related length of hospitalization trends and in-hospital mortality in Peru. PeerJ. 2022, 10:e14467. 10.7717/peerj.14467
22. Lau LH, Lew J, Borschmann K, Thijs V, Ekinci EI: Prevalence of diabetes and its effects on stroke outcomes: A meta-analysis and literature review. J Diabetes Investig. 2019, 10:780-92. 10.1111/jdi.12932