



Original Article

Epidemiology and Risk Factors of Stroke in Tabriz, Iran: A Population Based Study

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Abstract

Objective: Cerebral vascular events are the second leading cause of mortality worldwide and is increasing in developing countries. Epidemiological studies are important to improve outcomes and preventive and supportive strategies. This research was aimed to study epidemiology of stroke in Tabriz, Iran.

Materials and Methods: This cross-sectional, analytic population-based study was performed from May 2009 to April 2010. Information about probable stroke events was obtained from 5000 randomly selected people. In a door-to-door process, questionnaires were completed by a trained team. Any probable stroke case was referred to a stroke expert for further evaluation. After diagnosing stroke cases, 214 healthy people were assembled for a control group to compare stroke related risk factors.

Results: Out of 5000 studied people, 34(0.68%) stroke patients, with a mean age of 68.7 years (range: 38-85), were detected. Nineteen (56%) patients were male, 31 (91%) were ischemic, and 3 (9%) had hemorrhagic stroke. Six first-ever strokes occurred in the 1 year study period. Identified risk factors included hypertension in 25 (74%), hyperlipidemia in 11 (32%), diabetes mellitus in 9 (27%), smoking in 10 (29%) and coronary artery disease in 6 (18%).

Conclusion: This report showed a high incidence rate of stroke of about 120 per 100,000 people and a remarkably high prevalence of hypertension. It speaks to the need to make special health system strategies to raise awareness for primary and secondary prevention of stroke.

Keywords: Tabriz, Iran, Stroke, Incidence, Epidemiology

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Introduction

Stroke is a leading cause of death and disability worldwide, and there are many reports about the increasing burden of stroke since 1990 [1-3]. This increasing burden of stroke has been detected more in low-income and middle-income countries and is associated with potentially modifiable environmental, metabolic, occupational, physiological, and behavioral risk factors [3].

There are large geographic variations in stroke incidence and mortality around the world. Most reported information about stroke incidence and prevalence in Iran has historically been based on stroke patients admitted in hospitals [4-11]. However, hospital-based studies usually cannot show real incidence and prevalence rates; population-based studies can report these more reliably. Until this study, only two population-based studies have

been published in Iran: in Mashhad (2006–2007) and Isfahan (2006-2013) [12,13].

This article presents the results of a population-based study on stroke epidemiology and accompanying risk factors in Tabriz, a large city in the north-west of Iran.

Materials and Methods

In this cross-sectional study, 5000 individuals were randomly chosen by postal code in Tabriz, Iran. Information was gathered about the participants regarding stroke occurrence over a one-year duration from May 2008 to April 2009.

The study protocol was reviewed and approved by Neurosciences Research Center, Tabriz University of Medical Sciences and the local ethics committee. Informed consent

was obtained from each participant before any interview or neurologic examination.

In door-to-door inquiries, probable stroke cases in the study population were identified. These patients were referred to the Neurosciences Research Center at Imam Reza Hospital for complete evaluation by stroke experts. Patients who were unable to get to this center were visited and studied at home. For inclusion in this incidence study, the stroke case should be resident in the study area within the research time period.

In all diagnosed stroke cases, a medical history was obtained, including incidence of hypertension, diabetes, hyperlipidemia, smoking, alcohol consumption, atrial fibrillation, and other cardiac diseases from interviews, physical examinations, and medical records. In this phase, the researchers defined a control group to compare risk factors in the population: 240 normal individuals with no history of stroke, living near the stroke cases, were evaluated.

Statistical analysis

Continuous data with normal distributions are given as mean ± standard deviation, otherwise as median, Chi-square or Fisher’s exact test for testing significance. A *p*-value of 0.05 or less is considered significant.

Results

Among 5000 individuals studied, 2520 (50.4%) were female and 2480 (49.6%) were male with a mean age of 56.7 years (range: 34-85). Out of these 5000 people, 34 (0.68%) stroke patients, with a mean age of 68.7 years (range: 38-85), were detected. Nineteen (56%) patients were male, 31 (91%) were ischemic, and 3 (9%) had hemorrhagic stroke. Six first-ever strokes occurred in the 1 year study period. Identified risk factors included hypertension in 25 (74%), hyperlipidemia in 11 (32%), diabetes mellitus in 9 (27%), smoking in 10 (29%) and CAD in 6 (18%). Logistic regression showed a significant relationship between hypertension and diabetes with stroke incidence (*p*=0.02).

Among 34 cases that had a stroke at least is a prevalence of 680 per 100,000 population, and 6 (0.012%) patients with a first-time stroke in the study period shows a crude incidence rate of 120 per 100,000 people. All new stroke cases were ischemic.

Risk factors of stroke

Based on 34 stroke cases, 214 individuals were randomly selected as a control group from neighbors of stroke cases to compare important risk factors. Stroke patients were significantly older than the control group. Hypertension, hyperlipidemia, smoking, and diabetes were showed significant difference (*p*<0.001). Atrial fibrillation was detected in one patient and one female patient used oral contraceptives. [Table 1](#) shows the complete information.

Mortality and disability of 34 stroke patients were evaluated. [Table 2](#) shows patients’ functional state based on the modified Rankin scale after stroke.

Table 1: Vascular risk factors in stroke cases and the control group

Risk factors	Stroke group (n=34)	Control group (n=214)	<i>p</i> -value
Age (mean±SD)	68.73±12.19	34.69±18.55	<0.001
Male (%)	19 (55.9%)	108 (50.5%)	0.58
Hypertension	25 (73.5%)	19 (8.9%)	<0.001
Diabetes	9 (26.5%)	6 (4.8%)	<0.001
Hyperlipidemia	11 (32.4%)	11 (5.1%)	<0.001
Smoking	10 (29.4%)	37 (17.3%)	0.07
Cardiovascular disease	6 (17.6%)	12 (5.6%)	0.02

Table 2: Functional disability of 34 stroke patients

Modified rankin scale	N (%)
0	2 (5.9)
1	11 (32.4)
2	7 (20.6)
3	5 (14.7)
4	1 (2.9)
5	2 (5.9)
6 (death)	6 (17.6)

Discussion

In our investigation, we found a prevalence rate of 680 per 100,000 population and a crude incidence rate of 120 per 100,000 for stroke; hypertension, diabetes, and hyperlipidemia were detected as the major risk factors.

There are many population-based studies about stroke in the world [2,14,15,16,17,18]. As a primary overview showed, the global burden of stroke is high and its incidence is predicted to increase in future decades as a result of demographic and epidemiological transitions in populations, especially in less developed countries [2]. A systematic review in 2009 reported a divergent, significant trend in stroke incidence rates, with a decrease of 42% in stroke incidence in high-income countries and a more than 100% increase in the incidence in low to middle-income countries [16].

In developing countries, only a few population-based studies about stroke epidemiology have been published. A study in 2005, in Trivandrum, Kerala, among 926,000 people, showed a stroke incidence of 135 per 100,000. Stroke occurred at a median age of 67 years. The most important risk factors were hypertension (82% in urban, 89% in rural), diabetes (49% in urban, 56% in rural), smoking (23% in urban, 39% in rural) and dyslipidemia (25% in urban, 27% in rural) [19]. A community-based study in 2010 in Egypt across 6,498 participants performed in 3 phases detected 57 stroke cases, giving a crude prevalence rate of 963 per 100,000 inhabitants with an age-adjusted local prevalence rate of 699.2 per 100,000. This prevalence increased to 980.9 per 100,000 when considered in the world’s population. Hypertension was reported in 66% of cases, and diabetes mellitus in 39% as the main risk factors [20].

Based on a recently published review in Pakistan, annual incidence of stroke was 250 per 100,000 with 350,000 cases of stroke every year. The incidence of stroke in the Chinese

population is 205–584 per 100,000 individuals. In India the average incidence of stroke is 145 per 100,000, with a high mortality rate of about 33%. In Chinese stroke cases, hypertension in 88%, smoking in 48%, and alcohol use in 44% were reported as common risk factors. A community-based study in the Eastern Province of Saudi Arabia showed the prevalence of stroke is 178 per 100,000 that is not much different from other reports in Saudi Arabia [21].

In Iran, only two population-based studies have been published. The first was the Mashhad Stroke Incidence Study (MSIS) that was done over one year in 2006 to 2007. This study covered a population of 450,229 in Mashhad and any stroke occurrence was prospectively ascertained. Multiple overlapping sources were used to detect individuals with stroke. Any possible cases of stroke were reviewed by stroke experts before inclusion as a stroke case. Finally, 624 first-ever strokes occurred in the study period and a crude annual incidence rate of first-ever stroke (FES) (139; 95% CI, 128-149) per 100 000 residents was seen. When this rate was adjusted for European people aged 45 to 84 years, it increased to 616 (95% CI, 567-664) for ischemic stroke, 94 (95% CI, 75- 113) for intracerebral hemorrhage, and 12 (95% CI, 5-19) for subarachnoid hemorrhage per 100,000. In the other hand, age-specific incidences in younger patients was higher than in Western countries. MSMI revealed that age-specific incidence rates of stroke in Mashhad occurs approximately 1 decade earlier than in Western countries. The most common risk factors of FES cases were hypertension (52% in men, 71% in women), diabetes (30% in men, 31% women), hyperlipidemia (22% in men, 28% in women), and current smoking (18% in men, 12% in women)[12].

The second published Iranian population-based study was the Isfahan Cohort Study (ICS) conducted from 2006 to 2013. After a follow-up of 32,893 person-years, 43 new stroke cases in men and 48 stroke cases in women occurred. This is a crude incidence rate of 265 in men and 279 in women per 100,000. Stroke risk factors were not reported [13].

Our study in Tabriz was showed stroke prevalence and incidence rates falling between the two above-mentioned studies in Iran. In regard to risk factors, high blood pressure was the most common, followed by diabetes and hyperlipidemia. This is compatible with the national and international studies.

In conclusion, incidence and prevalence of stroke incidence and hypertension as its main risk factors are higher in Tabriz than in other reports in Iran. Preventive strategies should be adopted to decrease the burden of stroke.

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Conflict of interest

There is no conflict of interest in doing this research.

References

- Menken M, L. Munsat T, Toole J. The Global Burden of Disease Study: Implications for neurology 2000. 418-20 p.
- Feigin VL, Lawes CMM, Bennett DA, Anderson CS. Stroke epidemiology: A review of population-based studies of incidence, prevalence, and case-fatality in the late 20th century. *Lancet Neurol.* 2003;2(1):43-53.
- Feigin VL, Roth GA, Naghavi M, Parmar P, Krishnamurthi R, Chugh S, et al. Global burden of stroke and risk factors in 188 countries, during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet Neurology.* 2016;15(9):913-24.
- Ahangar AA, Saravi M, Alijanpour S, Boora MM, Hoseinalipour S, Zadeh HH, et al. Comparison of Risk Factors of Stroke and Myocardial Infarction in Patients 15 to 45 Years in Affiliated Hospitals of Babol University of Medical Sciences. *Zahedan Journal of Research in Medical Sciences.* 2016;18(12).
- A.A., Hosseini, D., Sobhani-Rad, K., Ghandehari, H.T.S., Benamer. Frequency and clinical patterns of stroke in Iran - Systematic and critical review. *BMC Neurology.* 2010;10(72):1-10.
- Firoozabadi MD, Kazemi T, Sharifzadeh G, Dadbeh S, Dehghan P. Stroke in Birjand, Iran: a hospital-based study of acute stroke. *Iranian Red Crescent medical journal.* 2013;15(3):264.
- Farhoudi M, Mehrvar K, Sadeghi-Bazargani H, Hashemilar M, Seyedi-Vafae M, Sadeghi-Hokmabad E, et al. Stroke subtypes, risk factors and mortality rate in northwest of Iran. *Iranian journal of neurology.* 2017;16(3):112.
- Borhani-Haghighi A, Safari R, Heydari ST, Soleimani F, Sharifian M, Kashkuli SY, et al. Hospital mortality associated with stroke in southern Iran. *Iranian journal of medical sciences.* 2013;38(4):314.
- Habibi-koolae M, Shahmoradi L, Niakan Kalhori SR, Ghannadan H, Younesi E. Prevalence of Stroke Risk Factors and Their Distribution Based on Stroke Subtypes in Gorgan: A Retrospective Hospital-Based Study—2015-2016. *Neurol Res Int.* 2018;2018:1-7.
- Ghandehari K, Izadi Z, Khorasan Stroke Registry. The Khorasan Stroke Registry: results of a five-year hospital-based study. *Cerebrovasc Dis.* 2007;23(2-3):132-139.
- Mostafavi A, Sekhavatfar P, Tabatabaei SA, Khavandi S, Rasoulighasemlouei S. Prevalence of cardiac risk factors in ischemic stroke in a university medical center in Tehran. *Iran Hear J.* 2016;17(1):57-63.
- Azarapazhooh MR, Etemadi MM, Donnan GA, Mokhber N, Majdi MR, Ghayour-Mobarhan M, et al. Excessive incidence of stroke in Iran: evidence from the Mashhad Stroke Incidence Study (MSIS), a population-based study of stroke in the Middle East. *Stroke.* 2010;41(1):e3-10.
- Nizal Sarrafzadegan M, Sadeghi M, Shahram Oveisgharan M, Marshall T. Incidence of cardiovascular diseases in an Iranian population: the Isfahan Cohort Study. *Arch Iran Med.* 2013;16(3):138-44.
- Di Carlo A, Launer LJ, Breteler MM, Fratiglioni L, Lobo A, Martinez-Lage J, et al. Frequency of stroke in Europe: A collaborative study of population-based cohorts. ILSA Working Group and the Neurologic Diseases in the Elderly Research Group. *Italian Longitudinal Study on Aging. Neurology.* 2000;54(11 Suppl 5):S28.

15. Whisnant JP, Wiebers DO, O'Fallon WM, Sicks JD, Frye RL. A population-based model of risk factors for ischemic stroke: Rochester, Minnesota. *Neurology*. 1996;47(6):1420-1428.
16. V.L. F, C.M. L, D.A. B, S.L. B-C, V. P. Worldwide stroke incidence and early case fatality reported in 56 population-based studies: a systematic review. *Lancet Neurol*. 2009;8(4):355-369.
17. Lavados PM, Hennis AJ, Fernandes JG, Medina MT, Legetic B, Hoppe A, et al. Stroke epidemiology, prevention, and management strategies at a regional level: Latin America and the Caribbean. *The Lancet Neurology*. 2007;6(4):362-72.
18. Anderson CS, Jamrozik KD, Burvill PW, Chakera TM, Johnson GA, Stewart-Wynne EG. Determining the incidence of different subtypes of stroke: results from the Perth Community Stroke Study, 1989-1990. *Med J Aust*. 1993;158(2):85-89.
19. Sridharan SE, Unnikrishnan JP, Sukumaran S, Sylaja PN, Nayak SD, Sarma PS, et al. Incidence, types, risk factors, and outcome of stroke in a developing country: the Trivandrum Stroke Registry. *Stroke*. 2009;40(4):1212-8.
20. Khedr EM, Elfetoh NA, Al Attar G, Ahmed MA, Ali AM, Hamdy A, et al. Epidemiological study and risk factors of stroke in Assiut Governorate, Egypt: community-based study. *Neuroepidemiology*. 2013;40(4):288-94.
21. Hussain G, Rasul A, Anwar H, Sohail MU, Kamran SK, Baig SM, et al. Epidemiological Data of Neurological Disorders in Pakistan and Neighboring Countries: A Review. *Pakistan Journal of Neurological Sciences (PJNS)*. 2017;12(4):52-70.