

Original Article



The role of history of blood pressure and diabetes in the prevalence of stroke in Azar cohort

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Abstract

Introduction: The prevalence of diabetes and hypertension has been growing steadily in the last decade. These are important risk factors for stroke and the contribution of each risk factor may change due to geographical location. We conducted the present study with the aim of determining the relationship between blood pressure and diabetes history and stroke in the population covered by the Azar Cohort.

Methods: In this case control study which was a subset of Azerbaijan province study (Azar Cohort), 357 patients were divided into patients with and without a history of stroke. The two variables of hypertension and diabetes history, in these two groups were compared. Data were collected and compared with inferential statistical tests.

Results: The results showed that blood pressure could increase the risk of stroke by 3.68 times (95% CI: 2.32-5.86). The history of diabetes mellitus in people with and without stroke was not statistically significant (OR=1.54; 95% CI: 0.87-2.72).

Conclusion: The results of this study showed that high blood pressure is a predictor of stroke but diabetes cannot be effective in stroke in the cohort population of Azerbaijan.

Introduction

Analysis of data from global studies of disease burden has shown that 90% of the risk of stroke is related to controllable risk factors such as high blood pressure, dyslipidemia, obesity, and hyperglycemia, while 74% can be related to behavioral risk factors including smoking, inactivity, and unhealthy nutrition; 29% of the risk is related to air pollution.¹ In Iran in 1960, the most common causes of death were infectious diseases and diarrhea, which in recent decades has become cardiovascular disease. Cardiovascular diseases are the leading cause of death and disability in Iran, which accounts for 46% of deaths and 20 to 23% of the disease burden.² In Iran, ischemic heart disease, accident, cancer, and stroke are leading causes of death, respectively.³

Cerebrovascular lesions have been identified as one of the main causes of damping and disability in developing and advanced societies, which imposes heavy diagnostic and therapeutic costs on patients and health care systems.⁴ In Iran, stroke is one of the most common causes of death. There are no accurate statistics on patient mortality rates in Iran⁵; given the increasing prevalence of cerebrovascular disease and its mortality, and considering

that hypertension is one of the main risk factors for stroke, it is necessary to evaluate mortality in patients with hypertension. On the other hand, in different studies, the effects of this variable on the incidence of mortality have been reported in various ways. In some studies, no association has been observed between hypertension and stroke mortality.⁶

The prevalence of stroke in diabetic patients is higher than in people without diabetes; it has also been found that mortality from stroke in diabetic patients is higher than in healthy individuals. It is believed that diabetes, with its physiological effects on the capillaries of the brain, leads to damage to the cerebral arteries and ultimately to stroke.⁷ A limited number of studies have shown that diabetes does not play a role in stroke and subsequent mortality⁸; however, the results of different studies in different geographical areas show the difference in the role of diabetes in the incidence of stroke, which indicates the effect of geographical area on the incidence of stroke.⁹

Since the prevalence of diabetes and hypertension has been growing steadily in the last decade, these two factors are important risk factors for stroke and the share of the effect of each risk factor may change depending on the

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geographical location. We performed the present study with the aim of determining the relationship between history of hypertension and diabetes and stroke in the population covered by the Azar Cohort.

Materials and Methods

Study design

This study is a case control study in which the clinical records of all participants in the Azerbaijan Cohort program affiliated to Tabriz University of Medical Sciences (the total number of subjects in this study was 14980) were evaluated as a part of the larger Persian cohort study (Prospective Epidemiological Research Studies of Iranian Adults).¹¹ Azar Cohort study was explained with more details in other published article.¹² The sample size was estimated based on the positive cases of stroke history among the population and doubled for the control groups. It should be noted that the samples participating in this study were matched in terms of age and gender. In this study, 357 people were evaluated based on inclusion and exclusion criteria and by available sampling method.

Inclusion and exclusion criteria

The most important inclusion criterion in this study was the age of 35-70 years. Only people living in the area were invited. The conditions for immigrants to enter the city or other countries were that they must have lived in the area for at least one year. In the case of non-immigrants, they had to reside in that area for at least 9 months of the year. Only people with Iranian citizenship entered the study. Exclusion criteria were people who were not willing to participate in the study, despite explaining the benefits of the study team, and anyone who had a problem and could not answer the questionnaires correctly.

The study of Azar Cohort has started since 2014. In this study, which is being conducted in Shabestar, Iran, people aged 35 to 70 who had the necessary conditions to study were included in the study. The study has 3 phases, the follow-up phase is currently underway. Necessary information about demographic indicators, nutrition, lifestyle, and medical history with standard questionnaires were collected by trained questionnaires; the method of data collection was face-to-face interview with the interviewers (the questionnaire was electronic). Based on this questionnaire, information about socio-economic status, lifestyle, occupation, medical history, drugs used, family history of diseases, fertility history, oral health, anthropometric information, blood pressure, eating habits, and cellphone and pesticides usage were collected. Also, blood samples were taken from all people for the necessary tests. The test related to fasting blood sugar was performed by Pars Azmoon kits. In the case of biological samples, blood samples, urine, hair, and nails were taken from all participants after obtaining consent. History of hypertension and diabetes were asked of all participants; blood pressure was measured twice from each arm at

10-minute intervals and their mean was recorded.

Data analysis

Qualitative variables of information were reported as number and percentage and quantitative variables were reported as mean and standard deviation. Independent *t* test was used to compare quantitative variables and chi-square test was used for nominal qualitative variables; regression logistics were also used to examine the association between a history of hypertension and diabetes with stroke.

Results

A total of 14980 people were evaluated at this stage, of whom 119 had a history of stroke; In other words, 79 people per thousand had this disease. Since 119 people had a history of stroke, twice as many were evaluated for the control group. In examining the demographic results of information between the two groups, it was observed that there was no statistically significant difference between variables such as gender and history of diabetes between the two groups; however, there was a statistically significant difference between history of blood pressure between the two groups participating in the study, so that these variables were significantly higher among people with stroke than the control group. The results of comparing the demographic information of the study participants are presented in the table below.

Comparison of the results of clinical characteristics of variables between the two groups showed that the levels of diastolic blood pressure (DBP) and systolic blood pressure (SBP) in the group of people with a diagnosis of stroke were significantly higher than the control group (Table 1).

The variables of history of diabetes and blood pressure were included in the analysis as potential independent variable in the model. The results of the regression model show that a history of high blood pressure increases the risk of stroke by 3.68 times, while a history of diabetes dose not role in the risk of stroke (Table 2).

Discussion

The results of this study showed that a history of high blood pressure could be a predictor of stroke; it was also observed that hypertension was significantly higher in the group with stroke than in the group without stroke. The study of Azar Cohort was designed and carried out to investigate the role of different variables in causing diseases. Also, no study has been conducted with cohort data that is population based and has examined the risk of stroke in the region of Azerbaijan and Iran, and this study is an innovation. Most studies on the etiology of stroke have shown that a history of high blood pressure can lead to stroke, and on the other hand, high blood pressure can lead to increased mortality in people with stroke.¹⁰

Another study looked at the relationship between arterial hypertension and stroke mortality. In this study,

Table 1. Demographic, laboratory, and clinical characteristics in case and control groups

Variable	Groups		P value
	Case group (n=119)	Control group (n=238)	
Gender, No. (%)			0.51 ^a
Male	55 (46.2%)	109 (45.8%)	
Female	64 (53.8%)	129 (54.2%)	
Age (mean ± SD)	58.75 (8.59)	58.75 (8.59)	0.99 ^b
History of diabetics, No. (%)			0.09 ^a
Yes	25 (21%)	35 (14.7%)	
No	94 (79%)	203(85.3%)	
History of blood pressure, No. (%)			<0.001 ^a
Yes	78 (65.5%)	81 (34%)	
No	41 (34.5%)	157 (66%)	
FBS (mean ± SD)	108.52 (33.44)	101.02 (39.98)	0.06 ^b
DPB (mean ± SD)	74.22 (11.23)	71.17 (7.94)	0.003 ^b
SBP (mean ± SD)	118.40 (18.55)	113.31 (15.36)	0.006 ^b

Abbreviation: FBS, fast blood sugar; DBP, diastolic blood pressure; SPB, systolic blood pressure

^a Chi-square; ^b Independent t test.

Table 2. Predictor factors of stroke in Azar Cohort population

Variable	OR	95% CI	P value
History of hypertension	3.68	2.32-5.86	<0.001
Yes			
No	Reference		
Diabetes			
Yes	1.54	0.87-2.72	0.13
No	Reference		

Abbreviations: OR: odds ratio; CI: confidence interval.

mortality was higher in people with high blood pressure than in people with normal blood pressure. The highest association between hypertension and mortality was less than 80 years old, and after 80 years there was less association between mortality and hypertension, which in part means that increasing age along with hypertension leads to increased mortality.¹³ A study by researchers suggests that the prevalence of hypertension in Iranians is strongly age-dependent. The prevalence of hypertension increases by 0.54% after the age of 20.¹⁴ Iranian studies^{2,15} indicate that the prevalence of hypertension is about 25% (in people over 18 years), which is due to the increase in the average age of the population and the increase in obesity, and this issue is not only in “It’s important in developed countries, but also in developing countries, and because the age of onset of high blood pressure has been declining in recent decades due to poor diets, obesity, urban living and stress,” he said. “High blood pressure is directly related to aging.” So that in old age, its prevalence reaches even more than 60%-70%. High blood pressure weakens and narrows the blood vessels in

the human brain and prevents proper blood flow. Also, this condition can cause blood vessels in the human brain to rupture and leak. As a result, high blood pressure is associated with an increased risk of stroke. They found that people with higher mean SBP had a higher risk of brain damage during the study period. The researchers also found that the risk of brain damage increased if the SBP was higher than the average of 46%.¹⁶ Higher than average DBP (second when reading blood pressure) was also associated with a 28% higher risk of brain damage. For better awareness, it should be noted that having one or more brain lesions was equivalent to about nine years of brain aging. Hence, high blood pressure essentially makes the brain older and puts it at risk for diseases such as stroke and Alzheimer’s. Accordingly, the treatment of hypertension is of particular importance.¹⁷

The results of the present study indicated that a history of diabetes could not play a role in stroke, while a number of studies have shown a strong association between diabetes and stroke; The mechanism of stroke in diabetic patients has been stated that cerebral arteries in diabetics are severely weakened, which leads to rupture of small cerebral arteries and eventually stroke; The results of our study are not in line with the results of other studies and it seems that the differences in geographical area, control of the effect of two variables age and gender (as confounding variables) and cultural differences due to these differences that need to be investigated is more.^{18,19}

Limitations

In this study, the types of hemorrhagic and ischemic strokes have not been studied separately. It is recommended to eliminate this weakness in future studies to achieve better results. The study of the relationship between history of blood pressure and diabetes with stroke in the population of Azerbaijan, which was first studied in a cohort study, can be used as a strength of this study.

Conclusion

In the population of Azerbaijan, it was found that the risk of stroke was high in people with a history of high blood pressure. However, having diabetes in this geographical area had no effect on stroke. However, further studies are needed in the future.

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Authors’ Contribution

All authors contributed to conception and design of the study and literature review, collected the data and contributed to data

Study Highlights

What is current knowledge?

- There are several risk factors for stroke
- High blood pressure and a history of diabetes can lead to stroke

What is new here?

- High blood pressure in the population of Azerbaijan increases the risk of stroke by 3.68 times
- History of diabetes in the Azerbaijani population has no effect on stroke

interpretation and drafting the manuscript.

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Ethic Approval

This research was approved by regional research ethics committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1399.051)

Conflict of Interest

Authors declare no conflict of interest in this study.

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