

Original article

Determining the effect of hypertension and diabetes following stroke in tertiary hospital, Aljouf, Saudi Arabia.

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Abstract:

Background: Stroke is a common neurological disorder with a high prevalence. The aim of this study was to determine the risk factor, prevalence, and association of types of strokes among diabetes and hypertension patients. **Methods:** A retrospective study was conducted in King Abdul Aziz, Qurayyat, Sakaka, and Tubarjal hospitals among stroke patients including both sexes within the age > 40 years. Type of stroke was identified by brain computed tomography scans or magnetic resonance imaging and risk factors for stroke and other details were noted on a checklist. **Results:** Out of 226 stroke patients considered for the present study, in which 48% were males and 52% were females. All lived in the Aljouf region. Most of the patients had risk factors which included Hypertension 49 (21.68%), Diabetes Mellitus 44 (19.46%), Combined (Hypertension and diabetes) 111 (49.11%), and Hyperlipidemia 22 (9.75%). Stroke patients > 60 years of age group showed a higher prevalence of ischemic stroke (p=0.001). The combined risk factor group also showed more prevalence of ischemic stroke (49.11%). **Conclusion:** Patient having both risk factor Hypertension and diabetes mellitus were major association with ischemic stroke. Majority of the patients with ischemic stroke age at onset > 60 year and irrespectively affected both males and females were equally.

Keywords: Stroke; Diabetics; Hypertension; Risk factor; Saudi Arabia; Ischemic stroke; Hemorrhagic stroke; Ischemic heart diseases;

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Introduction:

A stroke or Cerebro-Vascular Accident (CVA) includes the quick loss of brain function brought about by an interruption of blood supply to the cerebrum.

Set off by ischemia (absence of blood stream) or blockage (blood vessel embolism) or a hemorrhage.¹ Universally, the weight of stroke has expanded quickly in the course of recent many years.²

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Stroke has been assessed as the 2nd most reason for death and handicap changed life years.^{3,4} Current epidemiological information show that 16.9 million individuals endure a stroke every year, giving a worldwide rate of 258/100,000 people/year and representing 11.8% of absolute passages overall.^{4,5}

Al-Jouf, is an area of Saudi Arabia, capital city Sakaka, situated in the north of the nation, containing its solitary worldwide line with Jordan toward the west. It has a region of 100,212 km² and a populace of 440,009 at the 2010 Census. Still now there is no stroke related published data from this region. Studies in Saudi Arabia have given a hospital based rough yearly occurrence rate of stroke of 15.1 per 100,000 people in Jizan⁶, 29.8 per 100,000 people in the Eastern region⁷, and 43.8 per 100,000 people in Riyadh.⁸

Study reports the clinical highlights and neuroimaging relates of stroke in Saudi youngsters seen over a 5-year time span at the King Fahd Hospital of the University, Al-Khobar, Saudi Arabia. During the examination time frame, (31 young men, 13 young ladies; mean age, 26.2 months) of the 20,895 young seen had stroke; the yearly stroke rate was 29.7 per 100,000 in the young population.⁹ Now a days of three kinds of stroke exist: Transient ischemic stroke (TIA), Ischemic stroke (IS) and Hemorrhagic stroke (HS). An ischemic stroke, which is more common, happens when a blood coagulation lodges in the cerebrum. This blocks blood stream to different regions of the cerebrum. A hemorrhagic stroke, then again, happens when a vein in cerebrum tears open. This makes blood gather in the brain and harm cerebri tissue. Stroke risk factors include being over age 65 and with hypertension, diabetes, smoking, dyslipidemia, atrial fibrillation and congestive heart failure.¹⁰

Hypertension is a typical condition where the long-term force of the blood against artery walls is sufficiently high that it might at last reason medical issues, for example, coronary illness. Normal blood pressure is considered under 120/80 and the systolic pressure rises above 140, while diastolic blood pressure near to 90 consider as hypertension.¹¹ This sort of hypertension is generally regular in individuals beyond 65 years old and is caused by the loss of elasticity in the arteries.¹¹ The systolic pressure factor is considerably more significant than the diastolic pressure factor with regards to the danger of stroke for an older individual.¹¹ The increase in stroke frequency with age was more set apart in the individuals who

were hypertensive men (20.6/1000 in those aged 45 to 54 years to 33.5/1000 in those ≥ 65 years; $P < .01$).¹¹ Patients with hypertension, 2.4/100 will create coronary artery illnesses and 1.9/100 will have a stroke within 5 years.¹²

Furthermore, diabetes is a well-established risk factor for stroke. Diabetes can cause pathologic changes in blood vessels at different areas and can lead to stroke.¹³ Type 1 diabetes occurs when immune system of the body fighting with infection and destroys the insulin -producing beta cells of the pancreas. Researchers think people with type 1 diabetes for the presence of islet autoantibodies and infections, that might trigger the diabetes disease. Studies, for example, TrialNet are attempting to pinpoint reasons for type 1 diabetes.¹³ TrialNet information confirm the very high risk of type 1 diabetes among family members with multiple autoantibodies; generally, the rate of progression from multiple autoantibodies to clinical diabetes is 10–12% every year and can lead to stroke.¹⁴⁻¹⁷ Type 2 diabetes the most widely recognized type of diabetes is brought about by a few variables, including way of life components, qualities and genes. Type 2 diabetes represents over 90% of patients with diabetes and prompts microvascular and macrovascular complication of stroke.¹⁸ Studies showed, patient with diabetic are 2.9 times as likely to have a stroke compared with nondiabetic patients, a difference that is found in numerous racial/geographic groups.¹⁹⁻²⁰ A pre-stroke, otherwise called transient ischemic attacks (TIA), happens when there is a concise absence of blood stream to the cerebellum. The symptoms are like that of a stroke, yet it's side effect recover inside 24 hours, leaving no permanent damages. TIAs can fill in as a notice sign, giving an open door to clinician to prevent a completed stroke. For the individuals who do give a TIA with diabetes or hypertension, forceful treatment is similarly significant since diabetes and hypertension has been appeared to build the danger of complete stroke.²¹

Also, mortality is higher and results are more unfortunate in patients with stroke with uncontrolled diabetes and hypertension. Regardless of whether tight control of hyperglycemia is related with better results in intense stroke stage. Controlling diabetes and other related risk factors are effective ways to prevent beginning strokes as well as stroke recurrence.

In this narrative article, review the risk factor, hypertension, diabetes and hyperlipidemia lead to stroke

and outcomes in individuals. In Saudi, stroke is by all accounts expanding and mortality is unsatisfactorily high. Stroke related risk factors are likewise exceptionally high in the communities. The investigation will give the stroke awareness and sufficient information on stroke risk factors. This study will give fundamental information about risk factor of stroke in Aljouf region with stroke on set at age and types of stroke that will manage the improvement of target to prevent stroke in population at danger.

Materials and Methods:

Study Design: Cross-sectional hospital data based.

Study population:

The target stroke patient’s data collected from hospital record (Stroke file) of four different tertiary hospitals of Aljouf, KSA. Hospital includes Prince Mutaib Bin Abdul Aziz Hospital, (Sakaka), King Abdul Aziz specialized hospital, (Sakaka), Tabarjal General Hospital (Tabarjal), Alqurayyat General Hospital (Alqurayyat). Data collection and materials: Total 226 stroke patients’ data collected retrospectively from above mention hospital following inclusion and exclusion criteria based on convenient sampling method from January 2019 to February 2020. Checklist was used for data collection.

Inclusion criteria:

Stroke patients with brain CT scan and brain MRI evidence.

Exclusion criteria:

Any male or female patients develop stroke after road traffic accident, brain tumor, any space-occupying lesion, coagulation defect.

Statistical analysis: The data analyzed using SPSS 17 (SPSS, In., Chicago, IL, USA). Descriptive analyses performed and the variables were examined using chi-square test. Statistical significance defined as p values of less than 0.05.

Ethical approval: The study protocol submitted to Local committee of Bioethics (LCBE) of Jouf university for ethical approval. After ethical approval, Co researcher contacted with hospital director, after proper approval from the hospital director, co researcher started data collection from stroke record document.

Results:

All out 226 recorded stroke files were collected from Alqurayyat General Hospital (70), King Abdul Aziz specialized hospital (70), Prince Mutaib Bin Abdul

Aziz Hospital (54) and Tabarjal General Hospital (32). All stroke files fulfilled with checklist criteria are included in this study. Table 1 shows the socio-demographic and the types of strokes with cerebral ischemic infarct (73%) being the most common and hemorrhagic infarct (8%) the least common. There were more women (52%) with strokes of all types than men (48%). Fig 1 patients with ischemic stroke onset of age > 60 years, (p=0.001), 80.6% of patients with ischemic stroke age between 60 and 70, 81.3% of patients with ischemic stroke age >70. Table 2 shows risk factors which included Hypertension 49 (21.68%), Diabetes Mellitus 44 (19.46%), combined risk factor (HTN and DM) 111 (49.11%) and Hyperlipidemia 22 (9.75%). Fig 2 Combined risk factor (HTN and DM) group shows more prevalence of ischemic stroke 111 (49.11%) than single risk factor DM, HTN, and Hyperlipidemia. Table 3 Patients with more than 5-to-10-years duration of uncontrolled diabetic were more likely to develop ischemic stroke (39.37%) in compare with hemorrhagic stroke (4.41%). In addition, Patients having control diabetes with more than15 years were less to developed ischemic stroke 19 (8.40%) and very few chance to develop hemorrhagic stroke 2 (0.88%). Hypertension has remained the main variable indicator of all kind of stroke. Consequently, Duration of Hypertension under 5 years, more than 5 years, more than 10 years, and over 15 years shows high frequency of ischemic stroke 26 (11.50 %), 43 (19.02%), 38 (16.81%) and 24 (10.61%) respectively (Table 4). Patients who had uncontrolled hypertension between 5 to 10 years duration having more frequency of ischemic stroke (35.83%). Then again, patients with over 15 years duration of hypertension having less rate of ischemic stroke (10.61%) and hemorrhagic stroke 3 (1.32%) (fig 4). Table 5 shows there is significant association among risk factor/stroke and diabetes/stroke.

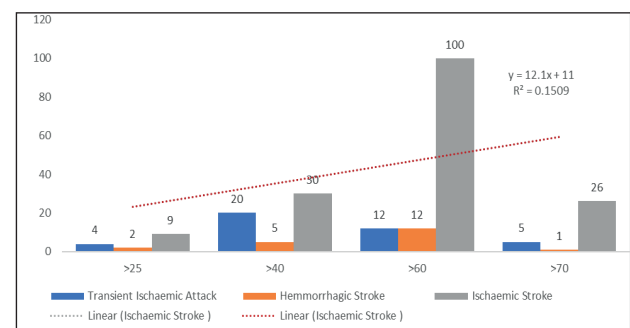


Figure 1. Age group with Stroke onset

Table 1. Demographics factors and Stroke crosstabulation

Demographic Factors	Grouping	Transient Ischaemic Attack	Hemorrhagic Stroke	Ischaemic Stroke	Pearson Chi-Square
Age * Stroke Crosstabulation	>25	4	2	9	
	>40	20	5	30	
	>60	12	12	100	<0.001***
	>70	5	1	26	
Gender * Stroke Crosstabulation	Male (48%)	17 (7.52%)	13 (5.75)	79 (34.95)	0.222
	Female (52%)	24 (10.61%)	7 (3.09)	86 (38.05)	
City * Stroke Crosstabulation	Qurayyat	10	12	48	0.059
	Sakaka	25	6	93	
	Tubarjal	6	2	24	

Table 2. Risk factors and Stroke crosstabulation.

Risk Factor	Stroke Type				Total	
	Transient Ischaemic Attack	Hemorrhagic Stroke	Ischaemic Stroke	Total		
Hypertension	7	7	35	49	21.68%	
Diabetes	7	2	35	44	19.46%	
Combined (Hypertension and diabetes)	17	11	83	111	49.11%	
Hyperlipidemia	10	0	12	22	9.75%	
total	41	20	165			

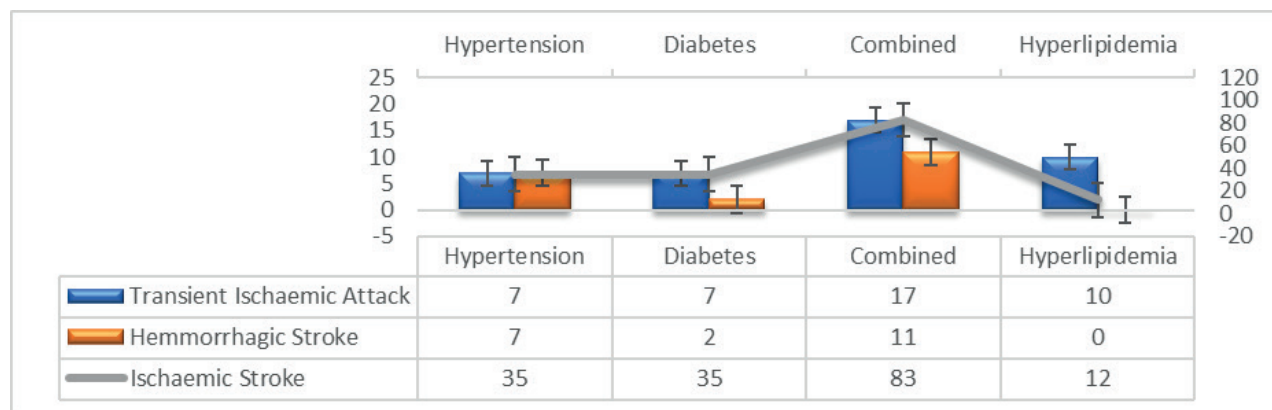


Figure 2: Risk factors and Stroke crosstabulation.

Table 3. Diabetes duration and Stroke crosstabulation.

	Year	Transient Ischaemic Attack	Hemorrhagic Stroke	Ischaemic Stroke	
Diabetic Duration	<5	8 (3.53%)	1 (0.4%)	25 (11.06%)	34
	>5	7 (3.09%)	7 (3.09%)	49 (21.68%)	63
	>10	2 (0.88%)	3 (1.32%)	40 (17.69%)	45
	>15	8 (3.53%)	2 (0.88%)	19 (8.40%)	29
Other risk factor		16	7	32	55
		stroke			Total 226

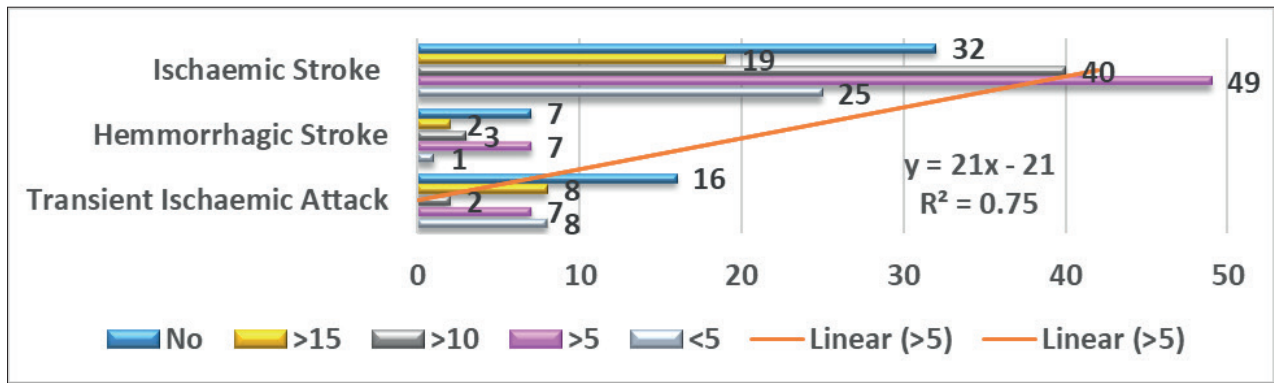


Figure 3: Diabetes duration and Stroke cross-tabulation.

Table 4. Hypertension duration and Stroke cross-tabulation.

	Year	Transient Ischaemic Attack	Hemorrhagic Stroke	Ischaemic Stroke	
Hypertension Duration	<5	5 (2.21%)	5 (2.21%)	26 (11.50 %)	36
	>5	10 (4.42%)	5 (2.21%)	43 (19.02%)	58
	>10	3 (1.32%)	5 (2.21%)	38 (16.81%)	46
	>15	5 (2.21%)	3 (1.32%)	24 (10.61%)	32
Other risk factor		18	2	34	54
		Stroke			Total 226

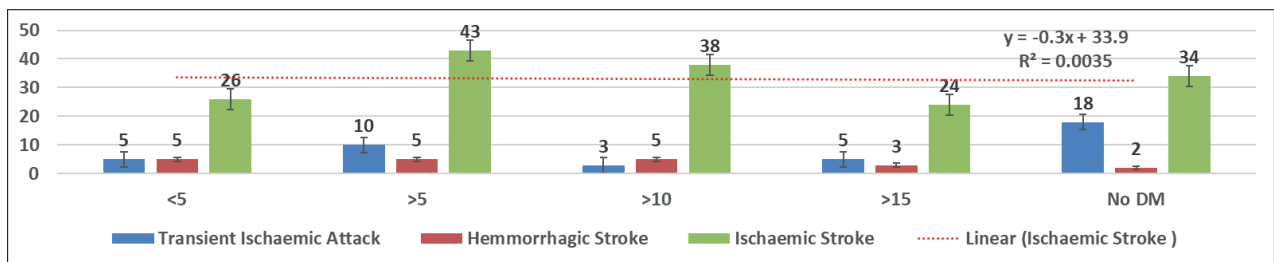


Figure 4. Hypertension duration and Stroke cross-tabulation.

Table 5. Association and correlation of factors and Stroke

Association & Correlation	Pearson Chi-Square	Likelihood Ratio	Pearson's R	Spearman Correlation
Risk factor/Stroke	0.013	0.017	.143 ^c	.208 ^c
Diabetes/Stroke	0.017	0.009	.024 ^c	.034 ^c
Hypertension/Stroke	0.059	0.057	.076 ^c	.186 ^c

Discussion:

Saudi Arabian National Guard community reports in 1993 that crude annual stroke incidence rate was 43.8 per 100,000⁸ and later on global stroke belt report in 2015, Saudi ranks 9 among other countries, representing stroke incidence rates 115.8/100,000 in

the world.²² Therefore, prevalence rate of stroke is increasing in Saudi nationwide. Regional differences and trends in the distribution major epidemiological risk factors may contribute to transnational differences in stroke disease. In this study showed high incidence of hypertension and diabetes together in

an individual has high risk factor for Ischemic stroke 49.11% and average age of stroke onset is more than 60 years. This result is more similar to other study inside the Saudi, reported that mean age 63, and ischemic stroke is high 76.2%.⁸ Another Study in Saudi, Gizan reported that hypertension (45.6%), heart diseases (31.1%) and diabetes mellitus (22.8%) as high-risk factor for stroke.⁶ However, nearby country Iranian Stroke Society reports that 300 stroke patients are admitted to hospitals every day in Iran and the average age of stroke onset is 10 years younger than the global average age (<https://goo.gl/pEDZZW>).²³ Therefore, unrecognized, untreated, and severe hypertension often associated with high risk for stroke. Severe hypertension is also associated with hemorrhagic stroke, which carries a higher risk of mortality and disability.²⁴ worldwide prevalence of hypertension was estimated to be 26% in 2000 and is projected to increase to 29% by 2025.^{25,26} Our study also showed Hypertension has remained the leading risk factor of all type of stroke (21.68%). Hypertension and stroke occur at a relatively younger age in Asians.²⁷ The incidence of stroke among female patients in Iran was relatively higher than male patients and the average age of stroke incidence was 68.²⁸

Hypertension and stroke occur at a relatively younger age (45-54 years) in Asians and the risk of hypertension increases at lower levels of body mass index of 23–25 kg/m².²⁹ Study in China appeared, 3367 (90.2%) were determined to have ischemic stroke, 222 (6.0 %) with intracerebral hemorrhage and 143 (3.8 %) with subarachnoid hemorrhage and mean age 60.³⁰ Also, Lower-level of education and smoking were related with hypertension ignorance, A significant extent (15.9 %) of Chinese patients with hypertension had not known about this risk factor until a clear stroke happened.³⁰ Ischemic stroke patients have a great exposure to hypertension risk factors whose control through lifestyle modifications can prevent a huge proportion of such incidences.³¹ In our study, despite the fact that the most frequent risk factor in TIA (18.14%), ischemic (73 %) and hemorrhagic (8.84 %) stroke subtypes is hypertension, diabetes and hyperlipidemia anyway patients having both HTN and DM risk factor consider together individual shows more prevalence of ischemic stroke 111 (49.11%). the chi-square test indicated that these outcomes were not statistical significant (P>0.05). Among patients admitted for acute stroke, diabetes mellitus

was associated with a higher risk of death and Hyperglycemia is a typical issue in persons with diabetes mellitus after an acute stroke.^{32,33}

Hyperglycemia gives more serious risk of stroke event in people with diabetes and is related with unsatisfactory clinical results (counting higher mortality), particularly following ischemic stroke.³⁴ Diabetes increases ischemic stroke incidence in all age groups, yet this risk is generally striking before the age of 55 years in African Americans and before the age of 65 years in Whites.³⁵ Recently a meta-analysis of 39 studies estimated the prevalence of diabetes to be 28%, the rate was higher in ischemic (33%) compared with hemorrhagic stroke (26%) inpatients.³⁶

Our finding suggested that uncontrolled diabetes patients lead to developed more ischemic stroke (21.68%) then hemorrhagic stroke 2 (0.88%) is consistent with findings of Bilic and Zhang.^{37,38} who reported similar results in Croatian and Chinese stroke populations, respectively.^{37,38} Burden of stroke is a soaring epidemic^{39,40,41}, this study will give significant proof about the ideal risk factor of stroke, just as the duration of hypertension and diabetes denoted a standard protocol that depicts the ideal degree of acute stroke just as its viability and wellbeing.⁴²

Limitation of the study:

We Will be collected stroke data from four different tertiary hospitals of al Jouf region. Because of limitation of time, we cannot increase the sample size and different variables data can give rise more conclusions.

Conclusions:

This first-in-Aljouf region in Saudi population revealed the results of stroke risk factor, age at onset and association of types of strokes among stroke patients. Significant disparities among ages for different type of stroke was found. More than 60 years of age groups showed higher onset of stroke. In our study we found majority of population both male and female were equally affected by stroke. Furthermore, Ischemic stroke was found more common in patient with 2 risk factors together diabetes and hypertension.

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Conflicts of Interest: None Declared

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