Association Between Stroke type and Hypertension, Diabetes and Dyslipidemia: a 7 years record analysis in northern Saudi Arabia

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Abstract:

Our main objective of this retrospective study was to evaluate the association of stroke type with the hypertension, diabetes, and dyslipidemia. We also included the relation of some other variables with the stroke type; such as age, and gender. retrospective cohort study. Data of 1298 patients (768 males; 530 females) were collected from clinical records on personal history of major patient who were hospitalized in king Khalid hospital in Hail city southern region of Saudi Arabia, between 2010-2016, suffering stroke according to their stroke type, and the presence of one of the major disorders which are (Diabetes or hypertension and dyslipidemia). The key findings from the present study regarding stroke incidence of patients with diabetes, arterial hypertension, and dyslipidemia, has been associated to the course and type of stroke (ischemic and Hemorrhagic). Ischemic type of stroke were the most common types in association with the major three variables in our study, as well as with the age and gender groups. Therefore, these three main disorders are found to be risk factor mainly for ischemic stroke, while its association with hemorrhagic stroke remains controversial.

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Introduction:

According to estimates by the WHO, stroke represented 5.7 million deaths as well as 16 million newbie occasions in 2005 and these numbers might get to 7.8 million and 23 million by 2030, respectively [1]. Stroke is the second leading cause of preventable mortality around the world and also the 4th leading cause of lost performance [2], as gauged by disability-adjusted life years. Evidence acquired from huge epidemiological research studies has actually disclosed that the risk aspects for stroke and their organizations with stroke were comparable in different parts of the world [3]. High blood pressure and diabetes mellitus impacts approximately 74.5 million as well as 23.6 million adults in the United States, respectively, and also roughly 75% of patients with diabetic's issues have concomitant hypertension [4]. Hypertension is a major risk element for ischemic stroke and intracerebral hemorrhage [5,6]. Elevated systolic pressure is a "direct, continual and independent" risk variable for stroke [5,6]. Isolated systolic high blood pressure is a specifically solid risk aspect for stroke in the senior and in those with type 2 diabetes mellitus [7]. Control of hypertension (BP), particularly systolic hypertension, has been plainly revealed to minimize the threat of stroke in several prospective controlled trials [6,7] Although there is a contract that BP > 140/90 mmHg must be dealt with, the optimal BP target has not been

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established [8,9], as well as the conclusive evidence validating that any type of class of antihypertensive agents offers special defense versus stroke is lacking [10]. Diabetes is one more threat element for stroke. Searching for from the 2010 meta-analysis of 102 possible research studies revealed that diabetic issues are connected with a roughly twofold raised threat for all sorts of stroke [11]. A testimonial of professional trials shows that early aggressive insulin management amongst younger people with Type 1 diabetes minimizes stroke occurrence, but not among older patients with lasting Type 2 diabetes mellitus [12]. The extensive glucose-lowering treatment (a glycated hemoglobin [HbA1c] degree <7.0%) has been revealed to lower the danger of microvascular problems and also may or may not be useful for the long-lasting decrease in the risk of CVD [13].

In interested in the relation between dyslipidemia and stroke. In a meta-analysis of long-term prospective research studies, mostly in Europe as well as North America, low-density lipoprotein cholesterol (LDL-C) was only decently related to ischemic stroke as well as unconnected to hemorrhagic stroke [14]. Similar results were discovered in a binational study in Northern Ireland and also France [15]. The relationship between product LDL-C and also ischemic stroke differs by type of ischemic stroke. Although a positive, as well as significant association, was discovered for atherothrombotic infarctions, an adverse significant organization was observed for cardioembolic infarction [16].

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Our main objective of this retrospective study was to evaluate the association of stroke type with the hypertension, diabetes, and dyslipidemia. We also included the relation of some other variables with the stroke type; such as age, and gender.

Methodology:

Type of study:retrospective cohort study.Data of 1298patients (768 males; 530females) were collected from clinical records on personal history of major patient who were hospitalized in king Khalid hospitalin Hail city southern region of Saudi Arabia, between 2010-2016, suffering stroke according to their stroke type, and the presence of one of the major disorders which are (Diabetes or hypertension and dyslipidemia).

Measurements: The variables studied were stroke, stroke, hypertension, diabetes, dyslipidemia, and co-variables were age, gender, we calculated the age-, sexadjusted relative risk (RRs) for association of stroke types with the variables mentioned above. And individual-level data on prevalence of each variable in combined with stroke incident.

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Statistical analysis:

The Stata and SPSS statistical packages were used.Variable and co-variables was modeled non-parametrically to fit a non-linear relationship without having to specify a parametric form (differences in stroke types in relation to specific variable were showed as relative risks (RR) and 95% confidence intervals (CI).

Results:

We conducted this retrospective study in king Khalid hospital in Hail city southern region of Saudi Arabia, of all incident strokes (ischemic, and hemorrhagic stroke) occurring between 2010-2016 including data of (N = 1298 patients), (768 males; 530females) with mean age of 68 years old (**Table1**). We included co-variables into our studies in relation to stoke type, such Age with relation to stoke and its types. We have observed that those patients aged above 81 years has the highest incidence of ischemic stroke, and hemorrhagic stroke were more common in younger patients less than 50 years old (**Table 2**).

Table1: Mean age of study population

N	Valid	1298
	Missing	0
Mean		68.4723
Minimum		1.00
Maximum		102.00

Table2: Age association with stroke type

Age group	stroke Type		Total
	ischemic	hemorrhagic	
<50years	144	44	188
51-60	157	23	180
61-70	257	20	277
71-80	311	17	328

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	81+	318	7	325
Total		1187	111	1298

Its recognized that the year of 2011 had the highest stroke incident and ischemic stroke type was the highest between the population of our study (N= 239 out of 1298 patients), comes after the year 2014 which account as (N = 228) ischemic stroke cases, and had the highest in hemorrhagic stroke as well. However, in 2013 Incidence of stoke were the lowest among the study population in those 7 years which was the period of data records of our studies (**Table 3**).

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Table 3: Types and incidence of stroke in the period of study

Year	StrokeType		Total
	ischemic	hemorrhagic	
2010	224	5	229
2011	239	18	257
2012	131	18	149
2013	79	19	98
2014	228	22	250
2015	192	19	211
2016	94	10	104

Total	1187	111	1298

Concerning the gender in relation to stroke type, in both genders the ischemic stroke were higher than the hemorrhagic type, but females showed more incidence in ischemic type than hemorrhagic than in males (**Table 4**). Relative risk (RRs) of stroke type = .948 (95%CI 0.918-0.979) and 1.85 (95%CI 1.24-2.79), respectively which emphasize the higher ischemic stroke cases between this study population (**Table 5**).

Table 4: Gender impact on stroke types

Gender	StrokeType		Total
	ischemic	hemorrhagic	
MALE	687	81	768
FEMALE	500	30	530
Total	1187	111	1298

Table 5: Relative risk estimation of gender relation to stroke

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for sex (MALE / FEMALE)	.509	.330	.786
For cohort strokeType = ischemic	.948	.918	.979

For cohort strokeType = hemorrhagic	1.863	1.244	2.791
N of Valid Cases	1298		

Less than 49% (N= 628) of study population were hypertensive patients, the finding in this study is that the ischemic stroke type was common than hemorrhagic stroke cases in patients with hypertension, however non hypertensive patients showed more relative risk to ischemic stroke type as well more than the hemorrhagic type of stroke RRs= 1.176 (95%CI 1.141-1.213) for ischemic stroke (**Table 6**).

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Table 6: Hypertension in association relative risk estimation with stroke type

Variables		StrokeType		Total
		ischemic	hemorrhagic	
	Hypertensive	558	70	628
	non hypertensive	629	41	670
Total		1187	111	1298

	Value	95% Confidence Interval	
		Lower	Upper
For cohort stroke Type = ischemic	1.176	1.141	1.213
N of Valid Cases	1298		

Patients with diabetes have higher hospital and long-term stroke mortality, more pronounced residual neurological deficits, more severe disability and prolonged hospital stay after acute stoke attach. This shift between types of stroke toward the higher incidence of ischemic stroke and lesser incidence of hemorrhagic type, but then relatively the diabetic patients showed more incidence of hemorrhagic stroke than the non-diabetic patients but still the ischemic stroke are the most common in both groups (**Table 7**). RRs = 0.891 (95%CI 0.858-925) and 3.58 (95%CI 2.39-5.36) respectively.

Table 7: Relative risk estimation of diabetes with stroke

Variables	Stroke Type		
	ischemic	hemorrhagic	Total
diabetic	477	81	558
non diabetic	710	30	740
Total	1187	111	1298

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for diabetes (diabetic / non diabetic)	.249	.161	.384
For cohort strokeType = ischemic	.891	.858	.925
For cohort strokeType = hemorrhagic	3.581	2.390	5.364

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N of Valid Cases	1298		

Dyslipidemia was found in our study population to be very low (N=191) comparing to the non- dyslipidemia incidence (N=1107), the results showed that ischemic stroke incidence were still most common even in patients with dyslipidemia (N=145 out of 191 patients with dyslipidemia has ischemic stroke) (**Table 8**). RRs= 0.807 (95%CI 0.744-0.875), and 4.102 (95%CI 2,905-5.792) respectively (**Table 8**).

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Table 8: Dyslipidemia in relative risk with stroke type

dyslipidemia		StrokeType		
		ischemic	hemorrhagic	Total
	yes	145	46	191
	no	1042	65	1107
Total		1187	111	1298

		95% Confidence Interval	
	Value	Lower	Upper
Odds Ratio for dyslipidemia (yes / no)	.197	.130	.298
For cohort strokeType =	.807	.744	.875

ischemic For cohort strokeType = hemorrhagic	4.102	2.905	5.792
N of Valid Cases	1298		

Finding of our studies on outcomes of stoke types and the impact on patients showed that most of ischemic stroke patients were normally discharge, as well as more than 48% hemorrhagic patients. However, the death incidence were second most common outcomes in both stroke types incidence (**Table 9**).

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Table 9: Outcomes of stroke type

OUTCOME	Stroke Type		Total
	ischemic	hemorrhagic	
normal discharge	757	51	757
died	209	33	320
DAMA	191	19	191
Transferred	30	8	30
Total	1187	111	1298

Discussion:

Our study showed that the ischemic stroke type was more common in older patients, when the hemorrhagic stroke was found to be more frequent with younger patients.in both genders the ischemic stroke were higher than the hemorrhagic type, but females showed more incidence in ischemic type than hemorrhagic than in males. In regards to stroke type, numerous studies have actually shown a rise in the threat of subarachnoid hemorrhagic in females [17,18]. Some research studies of ischemic stroke have revealed small distinctions in subtype systems. Nevertheless, a number of various other research studies have actually discovered no proof of sex differences in these subtypes [19,20].

The searching for of our study is that the ischemic stroke type was common compared to hemorrhagic stroke situations in patients with high blood pressure. In a multicenter possible research study of patients with recent noncardioembolic ischemic stroke, the very low-- normal (systolic BP <120 mmHg) compared with the high–normal (systolic BP 130–139 mmHg) BP was associated with increased risk of stroke (hazard ratio[HR]: 1.29; 95% CI: 1.07–1.56)[21].

The crude incidence of stroke among patients with diabetes is three times greater than in the general population[22,23]. We have found that the incidence of diabetes in our study population were high as 47%. In patients with glucose intolerance had double the risk of brain infarction compared with nondiabetics; the relative risk (RR) is greater in diabetic women than in men. The relative risk of stroke in persons with type 2 diabetes reaches a maximum in the 40–60-year-old

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group, with diabetic women comprising a greater proportion of patients with stroke than nondiabetic women[22,23].

Our finding showed the ischemic stroke were more common than hemorrhagic in diabetic patients. In the Honolulu Heart Study, the incidence of ischemic stroke was more than two-fold higher in diabetic patients compared to the general population (44.9 vs 20.7 per 1000), while the rates of hemorrhagic stroke were almost the same 10.1 versus 9.6 per 1000[24]. In a population-based study from Finland, diabetes was a risk factor for cerebral infarction (RR – 3.26) and unclassified stroke (RR – 5.76). In Asia Pacific Cohort Studies, the hazard ratio for ischemic stroke was 2.64 and for hemorrhagic stroke 1.13 (nonsignificant)[25]. In the Multiple Risk Factor Intervention Trial, diabetes was associated with a significantly increased risk of death from non-hemorrhagic stroke, while the risk of death from either subarachnoidal or intracerebral hemorrhage was not significantly elevated[26]. In the Copenhagen Stroke Registry, hemorrhagic stroke was six times less frequent in diabetic patients than in non-diabetic subjects[27].

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Incidence of dyslipidemia in our study population were low, however the ischemic stroke was most commonly in this condition than the hemorrhagic stroke. Furthermore. In the 2010 meta-analysis, the risk of total stroke was decreased significantly by treatment of statins, with each 1% reduction of total cholesterol predicting a 0.8% relative risk[RR]reduction of total stroke[28]. However, a recent meta-analysis of 18 randomized clinical trials did not find a significant association between the use of fibrates and the decreased risk of stroke[29]. According to the results of a pooled meta-analysis of six randomized placebo-controlled clinical trials among patients with Type 2 diabetes mellitus, fibrates did not decrease the risk of stroke[30]. Finally,

the results of a meta-analysis of the five large trials assessing the impact of fibrates on cardiovascular end points demon started a larger risk reduction (by 28%; 95% CI: 15–39%; or 30%; 95% CI: 19–40%, in patients with high triglyceride levels (<120 mmHg) compared with the high-- regular (systolic BP 130-- 139 mmHg)BP was related to <35 and tri glycerides >boosted threat of stroke(risk ratio [HR]: 1.29; 95%CI: 1.07- 1.56) [21]. The crude occurrence of stroke among patients with diabetes mellitus is 3 times higher than in the basic populace [22,23]. We have actually found that the incidence of diabetic issues in our research study population were high as 47 %.In patients with glucose intolerance had double the risk of brain infarction compared to nondiabetics; the family member risk (RR) is better in diabetic person women compared to in males. The loved one threat of stroke in persons with kind 2 diabetes mellitus reaches a maximum in the 40-- 60-year-old team, with diabetic person women comprising a better percentage of patients with stroke compared to nondiabetic women [22,23]. Our finding showed the ischemic stroke were even more typical compared to hemorrhagic in diabetic person patients. In the Honolulu Heart Study, the occurrence of ischemic stroke was greater than two-fold higher in diabetic patients as compared to the general populace (44.9 vs 20.7 per 1000), while the rates of hemorrhagic stroke were nearly the very same 10.1 versus 9.6 per 1000 [24]. In a population-based research study from Finland, diabetes mellitus was a threat variable for cerebral infarction (RR-- 3.26) and also unidentified stroke (RR-- 5.76). In Asia Pacific Cohort Studies, the danger proportion for ischemic stroke was 2.64 as well as for hemorrhagic stroke 1.13 (nonsignificant) [25] In the Multiple Risk Factor Intervention Trial, diabetic issues was related to a substantially boosted risk of death from non-hemorrhagic stroke, while the risk of death from either intracerebral or subarachnoidal hemorrhage was not substantially raised [26]. In the Copenhagen Stroke Registry, hemorrhagic stroke was six times much less constant in

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diabetic person patients compared to in non-diabetic topics [27]. Incidence of dyslipidemia in our research study populace were low, nonetheless the ischemic stroke was most typically in this problem compared to the hemorrhagic stroke. In the 2010 meta-analysis, the danger of total stroke was reduced dramatically by therapy of statins, with each 1 % reduction of overall cholesterol anticipating a 0.8 % loved one danger [RR] decrease of complete stroke [28]. A recent meta-analysis of 18 randomized clinical tests did not find a substantial organization in between the use of fibrates and also the reduced risk of stroke [29]. Inning accordance with the outcomes of a pooled meta-analysis of six randomized placebo-controlled scientific trials amongst patients with Type 2 diabetes mellitus, fibrates did not lower the threat of stroke [30]. Ultimately, the outcomes of a meta-analysis of the 5 large tests evaluating the impact of fibrates on cardio end points devil strated a bigger threat reduction (by 28 %; 95 % CI: 15-- 39 %; or 30 %; 95 % CI: 19-- 40 %, in patients with high triglyceride degrees (> 200 mg/dl) or atherogenic dyslipidemia (HDL-C 200 mg/dl) specifically, compared with nonatherogenic dyslipidemia patients (by 6 %; 95 % CI: 2-- 13 %) [31].

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Conclusion:

The key findings from the present study regarding stroke incidence of patients with diabetes, arterial hypertension, and dyslipidemia, has been associated to the course and type of stroke(ischemic and Hemorrhagic). Ischemic type of stroke were the most common types in association with the major three variables in our study, as well as with the age and gender

groups. Therefore, these three main disorders arefound to be risk factor mainly for ischemic stroke, while its association with hemorrhagic stroke remains controversial.

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