

# Prevalence of modifiable risk factors in patients of thrombotic CVA

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## Abstract

**Background:** CVA is a major cause of morbidity and mortality worldwide. It may result from brain infarction or haemorrhage. Majority are due to ischemic cerebral infarction. Ischemia may result from occlusion of blood vessel due to a disease process intrinsic to carotid and intracranial vessels or may relate to coexisting heart disease, predisposing to embolic phenomenon. **Objectives:** To study the prevalence of modifiable risk factors in patients of thrombotic CVA. **Materials and method:** The present case control study was conducted in the department of medicine of Government Medical College, Latur. Study population consisted of patients admitted and diagnosed as a case of thrombotic cerebrovascular accident and controls during study period of two year. Age and sex matched controls were selected with 1: 1 ratio. Total 359 cases of thrombotic cerebrovascular accident and 359 controls. An informed written consent was taken from all the enrolled subjects after a full explanation of the purpose of study. All the patients were evaluated by taking detail history of present illness, significant past and family history and physical examination findings. The subjects were questioned regarding their Life Style, Diet and Addiction. **Results:** It was seen that out of 359 cases of CVA, 227 were males and 132 were females. Out of 227 cases of males, maximum no of cases i.e. 74 (32.60%) were in 41-50 yrs. of age, and in females out of 132 cases, maximum no of cases i.e. 60 (45.46%) were in 61-70 yrs. of age. 54.04% cases had BMI > 25 KG/ m<sup>2</sup>. 48.19% cases were having Waist Hip Ratio > 90. Majority of the cases in VCA group were having lack of vegetables and fruits in their daily diet as compared to control group. 29.81% cases had Oil and Ghee consumption > 40 gms per day. 71.69% cases had salt consumption > 5 gms/day. Sedentary life style was seen in 83.01% of cases in CVA groups. 39.83% cases had betel nut addiction which was statistically significant when compared with controls. 37.33% cases had Gutkha addiction. 8.36% cases had alcohol consumption > 60 gms/day which was statistically not significant when compared with controls (5.01%). 10.59% cases in CVA group and 10.59% in control group had smoking addiction which was statistically not significant. 45.13% cases had habit of smokeless tobacco consumption which was statistically significant when compared with controls. **Conclusion:** Thus we conclude that CVA was more common in middle age males. Overweight and obesity, Waist Hip Ratio >90, Lack of fruits and vegetables in diet, excessive consumption of Oil and Ghee and Salt, sedentary and type A Life style, Betel Nut and Gutkha and Smokeless tobacco addiction were the common modifiable risk factors observed among the cases of CVA with statistically significant difference.

**Key words:** modifiable risk factors, CVA, sedentary life style.

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## INTRODUCTION

CVA is defined as rapidly developing clinical symptom and/or signs of focal (at times global) disturbance of cerebral function, with symptoms lasting > 24 hours, or leading to death with no apparent cause other than that of vascular origin. There is a wide range of severity from recovery in few days, through persistent, to death.<sup>1</sup> CVA is a major cause of morbidity and mortality worldwide.<sup>2</sup> It may result from brain infarction or haemorrhage.<sup>3</sup> Majority are due to ischemic cerebral infarction. Ischemia may result from occlusion of blood vessel due to a disease process intrinsic to carotid and

intracranial vessels or may relate to coexisting heart disease, predisposing to embolic phenomenon.<sup>4</sup> Each year there are about 1 million CVA in the European Union making it by far the most common neurological disorder.<sup>5</sup> After coronary heart disease and all cancer, CVA is the third common cause of death on world, causing about 4 million death in 1990, and three quarters of them in developing countries.<sup>5,6</sup> The brain is highly vascular organ, its profuse blood supply characterized by a densely branching arterial network. It has a high metabolic activity due in part to the energy requirements of constant neural activity.<sup>7</sup> A fall in cerebral blood flow to zero causes death of brain tissue within 4 – 10 minutes, value <16 – 18 ml/100 mg tissue per minute causes infarction within an hour; and values <20 ml/100 mg tissue per minute cause ischemia without an infarction unless prolonged for several hours or day.<sup>8</sup> CVA mortality rises rapidly with age.<sup>5</sup> The burden of stroke arises largely from the elderly population. However, there remains a small but significant subset of younger patients with ischemic CVA, in whom conventional risk factors play a small role. About 85% of all first CVA are ischemic, 15% are due to primary intracranial haemorrhage.<sup>5</sup> In India there is variable geographic area and there are different ethnic groups. These peoples have variability among group, region and age group having different lifestyle, dietary habits and addiction. There are different forms of betel nut used in these groups and regions. Research in conventional risk factors in MI and CVA like hypertension, hypercholesterolemia, diabetes mellitus obesity and smoking has been done but research on non-conventional risk factors like life style, dietary habit and addiction has not been done. These factors are major causes of morbidity and mortality in MI and CVA. There is no adequate data on these non-conventional risk factors. To identify prevalence of such risk factors and which will help to plan for making policy in view of reducing the incidence and prevalence of these non-conventional risk factors leading to morbidity and mortality of CVA study is under taken.

### MATERIALS AND METHOD

The present case control study was conducted in the department of medicine of Government Medical College, Latur. Study population consisted of patients admitted and diagnosed as a case of thrombotic cerebrovascular accident and controls during study period of two year.

**Case group (CVA group):** All the newly diagnosed cases of thrombotic cerebrovascular accident admitted in ICU or wards were enrolled in the study.

**Control group:** age and sex matched controls were selected with 1: 1 ratio.

Thus total 359 cases of Thrombotic cerebrovascular accident and 359 controls. An informed written consent was taken from all the enrolled subjects after a full explanation of the purpose of study. All the patients were evaluated by taking detail history of present illness, significant past and family history and physical examination findings. The subjects were questioned regarding their Life Style, Diet and Addiction. Required information was crossed-checked with relatives/care takers wherever possible. Information regarding factors like socio-demographic factors, Height, Weight, Waist Hip ratio, Vegetables and fruits consumed in their daily diet, type of diet ( veg/mixed) Oil/Ghee consumed >40 g/day, salt consumption daily more than 5 g/day, Life Style(sedentary/non sedentary), type A personality, Betel nut chewing, Gutaka chewing, alcohol consumption > 60 g/day, Smoking, Tobacco chewing and Addiction taken in details. Clinical Examination was done with standard protocol. Anthropometric measurements such as Height, Weight, Waist circumference was done. Data was analysed with software SPSS version 17 and by using statistical tests like chi square, Fisher’s exact test and percentage in Microsoft Excel.

**Table 1:** Distribution of cases of CVA according to Age and Gender

Age Group (Yrs.)	Male		Female		Total
	No.	%	No.	%	
21 to 30	39	17.18	14	10.60	53 (14.76)
31 to 40	25	11.01	12	9.09	37 (10.31)
41 to 50	74	32.60	02	1.51	76 (21.17)
51 to 60	15	6.61	25	18.94	40 (11.14)
61 to 70	47	20.71	60	45.46	107 (29.80)
<71	27	11.89	19	14.30	46 (12.82)
<b>Total</b>	<b>227</b>	<b>100</b>	<b>132</b>	<b>100</b>	<b>359 (100)</b>

It was seen that out of 359 cases of CVA, 227 were males and 132 were females. Out of 227 cases of males, maximum no of cases i.e. 74 (32.60%) were in 41-50 yrs. of age, and in females out of 132 cases, maximum no of cases i.e. 60 (45.46%) were in 61-70 yrs. of age.

**Table 2:** Distribution of Controls according to Age and Gender

Age Group (Yrs.)	Male		Female		Total
	No.	%	No.	%	
21 to 30	36	15.86	11	8.33	47 (13.09)
31 to 40	42	18.50	10	7.58	52 (14.49)
41 to 50	56	24.67	20	15.15	76 (21.17)
51 to 60	15	6.61	30	22.73	45 (12.53)
61 to 70	40	17.62	34	25.76	74 (20.61)
< 71	38	16.74	27	20.45	65 (18.11)
<b>Total</b>	<b>227</b>	<b>100</b>	<b>132</b>	<b>100</b>	<b>359 (100)</b>

Out of 359 controls, 227 were males and 132 were females. Out of 227 male controls, maximum no of controls i.e. 56 (24.67%) were in 41-50 yrs. of age, and out of 132 female controls, maximum no of controls i.e. 34 (25.76%) were in 61-70 yrs. of age.

**Table 3: Demographic distribution of study patients**

Variable	CVA		Controls		P value	
	No.	%	No.	%		
Occupation	Laborer	141	39.28	139	38.72	>0.05
	Farmer	157	43.73	157	43.73	
	Unemployed	31	8.63	32	8.91	
	Service	22	6.13	22	6.13	
	Business	08	2.23	09	2.51	
Education	Illiterate	223	62.12	191	53.20	>0.05
	Primary	102	28.41	91	25.35	
	Secondary	14	3.90	27	7.52	
	Higher secondary	20	5.57	31	8.64	
Place of Residence	Graduate	00	0.00	19	5.29	0.02*
	Urban	207	57.66	178	49.58	
	Rural	152	42.34	181	50.42	

\* Statistically significant

It was seen that majority of the patients in CVA and control group were farmer followed by laborer. CVA out of total of 359 cases, majority i.e. 223 (62.12%) cases were illiterate. In controls out of total of 359 subjects,

maximum no i.e. 191(53.20%) were illiterate. It was observed that out of 359 cases of CVA, majority of cases were from urban area (57.66%) whereas majority of the cases in control group were from rural area (50.42%).

**Table 4: Distribution of patients of CVA and controls according modifiable risk factors**

Modifiable risk factors		CVA		Controls		P value	OR value
		No.	%	No.	%		
Body Mass Index > 25 Kg/m <sup>2</sup>	Yes	194	54.04	37	10.31	0.000	10.23 (CI 6.75–15.56)
	No	165	45.06	322	89.69		
Waist Hip Ratio >90	Yes	173	48.19	38	10.31	0.000	7.86 (CI 5.20 – 11.90)
	No	186	51.81	321	89.69		
Lack of fruits and vegetables in diet	Yes	313	87.19	204	56.82	0.000	5.17 (CI 3.50 – 7.65)
	No	46	12.81	155	43.18		
Type of Diet	Vegetarian	107	29.81	112	34.04	0.69	0.94 (CI 0.67 – 1.30)
	Mixed	252	70.19	247	65.96		
Oil and Ghee Consumption > 40 gms per day	Yes	107	29.81	47	13.09	0.000	2.82 (CI 1.89 – 4.20)
	No	252	70.19	312	86.91		
Salt consumption more than 5 gms/day	Yes	257	71.69	137	38.16	0.000	4.08 (CI 2.95 – 5.65)
	No	102	28.41	222	61.84		
Life style	Sedentary	298	83.01	152	42.34	0.000	6.65 (CI 4.64 – 9.55)
	Non Sedentary	61	16.99	207	57.66		
Type A Personality	Yes	86	23.96	44	12.26	0.000	2.26 (CI 1.49 – 3.42)
	No	273	76.04	315	87.74		
Betel Nut Addiction	Yes	143	39.83	59	16.44	0.000	2.19 (1.51 – 3.18)
	No	216	60.17	300	83.56		
Gutkha Addiction	Yes	134	37.33	79	22.01	0.000	2.11 (CI 1.50 – 2.97)
	No	225	62.67	280	77.99		
Alcohol Consumption > 60 gms/day	Yes	30	8.36	18	5.01	0.07	1.73 (CI 0.91 – 3.30)
	No	329	91.64	341	94.99		
Smoking Addiction	Yes	36	10.03	38	10.59	0.81	0.94 (CI 0.57 – 1.56)
	No	323	89.97	321	89.41		
Use of Smokeless	Yes	162	45.13	82	22.84	0.000	2.78 (CI 1.99 – 3.89)
	No	197	54.87	277	77.16		

In CVA group out of total of 359 cases, 194(54.04%) cases had BMI> 25 KG/ m<sup>2</sup> which was statistically significant when compared with controls. In CVA group 48.19% cases were having Waist Hip Ratio > 90 whereas 10.31% cases were having Waist Hip Ratio > 90 in control group. The difference observed in CVA and

control group was statistically significant. Majority of the cases in VCA group were having lack of vegetables and fruits in their daily diet as compared to control group. Out of total of 359 cases of CVA, 252(70.19%) cases had Mixed diet with OR 00.94(CI 00.67–1.30) which was statistically not significant (p>0.05) when compared with

controls. It was seen that in CVA group 29.81% cases had Oil and Ghee consumption > 40 gms per day which was statistically significant ( $p < 0.05$ ) as compared with controls (13.09%). Out of total of 359 cases of CVA 257(71.69%) cases had salt consumption > 5 gms/day which was statistically significant ( $p < 0.05$ ) when compared with controls.

Sedentary life style was seen in 83.01% of cases in CVA groups and 42.34% of cases in control group and the difference observed was statistically significant. In CVA group 23.96% cases had Type A Personality which was statistically significant when compared with control group (12.26%). In CVA out of total 359 cases of,

143(39.83%) cases had betel nut addiction which was statistically significant ( $p < 0.05$ ) when compared with controls. In CVA out of total of 359 cases, 134(37.33%) cases had Gutkha addiction which was statistically significant ( $p < 0.05$ ) when compared with controls. In CVA group 8.36% cases had alcohol consumption > 60 gms/day which was statistically not significant when compared with controls (5.01%). 10.59% cases in CVA group and 10.59% in control group had smoking addiction which was statistically not significant. In total 359 cases of CVA, 162(45.13%) cases had habit of smokeless tobacco consumption which was statistically significant when compared with controls.

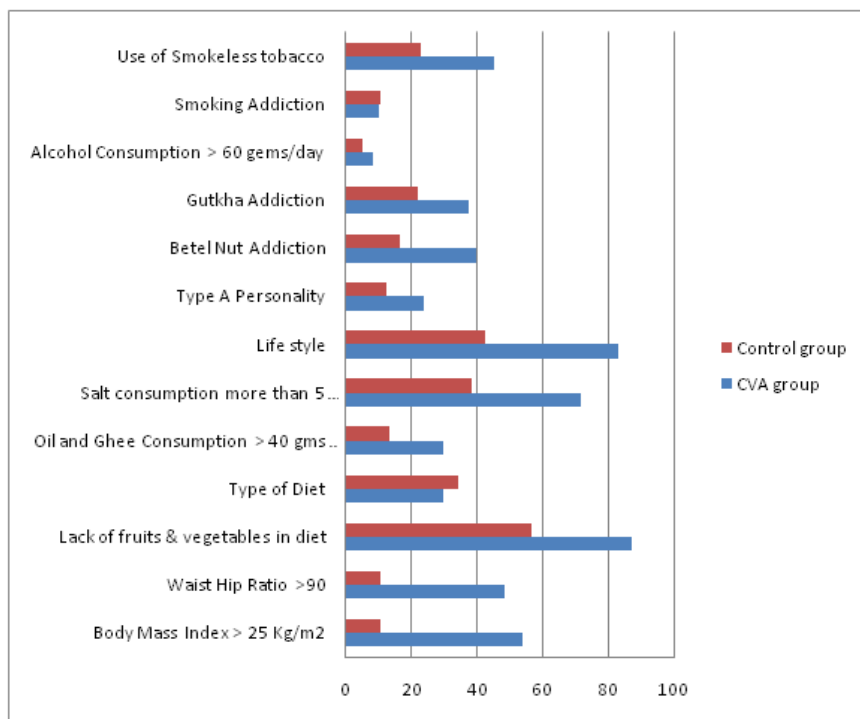


Chart 1: Distribution of patients of CVA and controls according modifiable risk factors

## DISCUSSION

In today’s world, most deaths are attributable to non-communicable diseases (36 million) with over half of these (17 million) are as a result of Cardiovascular disease; more than one-third of these deaths occur in middle-aged adults. In developed countries, ischemic heart disease and stroke are the first and second leading cause of death for adult men and women. These facts are familiar and hardly surprising, however, surprisingly in some of the developing countries, Ischemic Heart Disease and Stroke have also become the first and second leading causes responsible for one-third of all deaths.<sup>9</sup>

The present study was carried out at tertiary care hospital. The duration of study was 2 years. The study

sample was patients admitted in the study institute with newly diagnosed cases of CVA.

Out of 359 cases of CVA, 116 (32.31%) were in 41- 60 years of age group. The findings were comparable to a study done by Djarv T et al<sup>10</sup> where majority of the patients were in age group of 40 – 60 years. Age is an important risk factor for developing cardiovascular diseases. The risk of development of cerebrovascular accident increases with age.

Out of 359 patient of CVA in our study 227 (64.04%) were males and 132 (35.93%) were females. So males were dominant population in the present study.

In present study out of 359 cases of CVA, 194 (54.04%) cases had BMI > 25 kg/m<sup>2</sup> and 165(45.06) cases had BMI < 25 kg/m<sup>2</sup> with OR 10.23 which is statistically



significant. Thus our study showed BMI > 25 kg/m<sup>2</sup>s had significant association with thrombotic CVA patients. This result was similar with the study done by Adroaldo Baseggio Mallmann et al<sup>11</sup> in which BMI >25 Kg/m<sup>2</sup> was found in 73 (54.90%) cases of CVA. Risk of atherosclerotic vascular disease in men and women, is greater in obese, particularly if the weight has been gained in middle age or has fluctuated substantially. The higher risk in obese may be mediated by associated hypertension and diabetes<sup>12,13,14</sup>.

In CVA group 48.19% cases were having Waist Hip Ratio > 90 whereas 10.31% cases were having Waist Hip Ratio > 90 in control group. The difference observed in CVA and control group was statistically significant. Thus the study showed WHR > 90 cm had significant association with thrombotic CVA.

Out of 359 cases of CVA, 313 (87.19%) patients were having lack of vegetables and fruits consumption in their daily diet and 46 (12.81%) patients were having vegetables and fruits consumption in their daily diet with OR 5.17 which was statistical significant (p<0.05). Thus the study showed lack vegetables and fruits in daily diet had significant association with thrombotic CVA. Pure vegetarian diet was observed in 107 (29.81%) cases and 252 (70.19%) cases were having mixed diet with OR 0.94 which was statistically not significant (p > 0.05). Thus mixed diet had no significant association with CVA. It was seen that 107(29.81%) patients were consuming oil and ghee > 40 gms/day and 252 (70.19%) with OR 2.82 which was statistically significant (p< 0.05). Oil and ghee consumption of >40 gms/day had significant association with CVA. Consumption of salt >5gms/day was observed in 84.96% patients of CVA while 15.04% were consuming salt < 5 gms/day with OR 4.08 which was statistically significant. Thus salt consumption > 5 gms/day had significant association with CVA. Omega-3 polyunsaturated fatty acids and less saturated fatty acids consumption may reduce stroke risk<sup>15</sup>. Excessive salt intake may increase blood pressure and increase stroke risk<sup>16</sup>. High intake of potassium reduces the stroke risk by lowering blood pressure<sup>17</sup>.

Out of 359 cases of CVA, 298(83.03%) patients were having sedentary lifestyle and 61(16.99%) were non sedentary lifestyle with OR 6.65 which was statistically significant (p < 0.05). Exercise reduces the blood pressure, plasma cholesterol, and fibrinogen, and the risk of non-insulin dependent diabetes. Thus lack of exercise is associated with stroke<sup>18</sup>.

It was observed that 23.96% cases of CVA had type A personality and in 76.04% cases no stress was seen with OR 2.26 which was statistically significant (p < 0.05). This result were similar to study done by Sayed

Muhammad Adann Shah et al<sup>19</sup> 16(32.00%) cases had stress and 34(68.00%) cases had no stress.

Our study of 359 cases of CVA, 143 (39.83%) were having Betel nuts chewing addiction and 216 (60.17%) were not having Betel Nuts chewing addiction with OR 2.19 which was statistically significant. Thus betel nut chewing addiction had significant association with thrombotic CVA.

Gutkha chewing addiction was seen in 37.33% case of CVA whereas 62.67% were not having Gutkha chewing addiction with OR 2.11 which has statistically significant(p < 0.05).

Alcohol consumption >60 gms/day was reported by 37.33% cases of CVA whereas 62.67% cases had alcohol consumption < 60 gms/day with OR 2.38 which was statistically not significant (p>0.05). Similar findings were also reported by Adroaldo Baseggio Mullamann et al.<sup>11</sup> Modest consumption of alcohol might be protective for ischemic stroke<sup>20</sup>. It is difficult to disentangle any causal pathway from alcohol consumption to stroke, because alcohol almost certainly raises the blood pressure<sup>21</sup>, affects blood lipids, can cause atrial fibrillation and cardiomyopathy.

Addiction of smoking was seen in 23.96% cases of CVA and 76.04% were not having smoking addiction with OR 0.91 which was statistically not significant (p> 0.05). Thus our results showed smoking had no significant association with thrombotic CVA. The result were similar to study done by Manmohan Mehndiratta et al<sup>22</sup> where 31.25% were having smoking addiction and Adroaldo Baseggio Mallmann et al,<sup>11</sup> where 28.60% were having smoking addiction. Teng-Yeow et al<sup>23</sup> observed smoking in 24.60% cases.

Out of 359 cases of CVA, 162(45.13%) were having habit of smokeless tobacco consumption and 197(54.87%) were not having this habit with OR 2.78 which was statistically significant (p< 0.05). Thus the study showed that smokeless tobacco consumption had significant association with CVA. These results are similar to the findings mentioned in report on oral tobacco use and its implication in South East Asia by WHO<sup>24</sup>.

## CONCLUSION

Thus we conclude that CVA was more common in middle age males. Overweight and obesity, Waist Hip Ratio >90, Lack of fruits and vegetables in diet, excessive consumption of Oil and Ghee and Salt, sedentary and type A Life style, Betel Nut and Gutkha and Smokeless tobacco addiction were the common modifiable risk factors observed among the cases of CVA with statistically significant difference.

## REFERENCES

1. Hatano S. Experience from a multicentre stroke register: a preliminary report, *Bulletin WHO*, 1976;54:541-43.
2. Banford J, Sanderock P, Dinnis, et al. A prospective study of acute cerebrovascular disease in the community: the Oxfordshire community stroke project 1981-86 : Methodology, demography and incident cases of first ever stroke. *J. Neurosurg.Psych.* 1998;51;1373-80.
3. Kistler JP, Ropper AH, Martin JB. Cerebrovascular disease: *Harrisons Principles of internal medicine*. Mc Graw Hill Inc1994;13(2):2233-56.
4. Warlow CP. Cerebrovascular disease: *Oxford Text book of Medicine*, Oxford Univesity presss 1998;21(2): 155-61, 170.
5. Peter Rothwell. Cerebrovascular disease. In: Michael Donarghy, editor. *Brains diseases of the nervosus system*.12th ed, New York; oxford University Press: 2009 .p . 1003- 16.
6. Murray CJL, Lopez AD. Alternative projection of mortality and morbidity by cause 1990-2020; *Global Burden of Disease Study*. *Lancet* 1997 ; 349:1498-1504.
7. Susan Standing. *Gray's anatomy The anatomy basis of clinical practice* 40<sup>th</sup> ed, Newyork: Elsevier Churchill livingstone; 2008. P.227,253.
8. Longo DL, Fauci AS, Kasper DL et al, editors. *Harrison's princeplesof internal Medicine*. 18<sup>th</sup>ed. New York : Mc Granth Hill; 2011.
9. WHO (2003), *The World Health Report 2003, Shaping the Future*.
10. Wise R.J.S. et al. Serial observationa on the pathophysiology of acute stroke. *Brain* 1983; 106:197-222.
11. Adroaldo Baseggio Mallmann, Sandra Costa Fuchs, Miguel Gus, Flavio Danni Fuchs, Leila Beltrami Moreira, *Population- Atributable Risk for Ischemic Stroke in a Community in South Brazil: A case-Control Study*, April 18,2012,PLos ONE 7(4):e35680.
12. Welin L. et al. Analysis of risk factors for stroke in a cohort of men born in 1913. *N.Engl J. Meed.* 1987; 317: 521-526.
13. Shinton R. et al . Body fat and stroke. *J. Epidemil. Community. Helth*1995; 49: 259-264.
14. Rexrode K.M. et al, A prospective study of body mass index, weight change and risk of stroke in women. *JAMA* 1927; 277 : 1539-1545.
15. Orenca A.J. et al. Fish consumption and stroke in men. *Stroke* 1996; 27: 204 -209.
16. Thelle D.S. Slat and blood pressure revisited. *Bmj* 1996; 312: 1240-1241.
17. Whelton P.K. et al. Effect of oral potassium on blood pressure. *JAMA* 1997; 277: 1624-1632.
18. Lee I.M. et al. Exercise and risk of stroke in male physician. *Stoeke* 1999;30:1
19. Syed Muhammad Adnan Shah, Syed Muhammad Salma Shah, Saima Khan, Shahzad Ur Rehma, Zakir Ahmad Khan, Wisal Ahmed, Zubair, "Addressing the impact of stroke risk factors in a case control study in tertiary car hospitals": a case control study in tertiary care hospitals of Peshawar, Khyber Phukhtoonkhwa (KPK) Pakistan.Shah et al. *BMC Research Notes* 2013, 6:268.
20. Wannamethee. S.et al. Patterns of alcohol intake and risk of stroke in middle aged British men, *Stroke* 1996 ; 27: 1033-1039.
21. Kaplan N.M. Alcohol and hypertension. *Lancet* 1995; 345: 1588-1589.
22. Manmohan Mehndiratta, Sanjay Pandey, Rajeev Nayak, Anwar Alam, *Posterior Circulation Ischemic Stroke- Clinical Charecterstics, Risk Factors, and Subtypes in a North Indian Population*, *Neurohospitalist*. 2012 April; 2 (2): 46-50.
23. Teng-Yeow Tan,MD; Mei-Chiun Tseng, PhD; Ku-Chou Chang, MD, *Risk Factors for Rirst-ever Ischemic Stroke: A Hospital-based Case-Control Study in Kaohsiung, Taiwan*.Sep15,2004,*ChangGungMedJ*2004;27:801-7.
24. Chobanian A.R. The influence of hypertension and other hemodynamic factors in atherogenesis. *Progr. Carsivasc. Dis.*1983; 26: 177-196.

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