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STROKE TYPES IN RELATION TO SEASONAL VARIATION AND MONTHS OF A YEAR

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ABSTRACT

Objective: To determine the onset and types stroke (ischemic and hemorrhagic) in associated with seasonal variation and months of a year, for better prevention at these times in future, to reduce morbidity and mortality related to stroke.
Study Design: This is a cross-sectional study
Place and Duration: This study was conducted at Medical unit one of Chandka Medical College Teaching Hospital Larkana, over a period of one year from March 2009 to February 2010.
Material and Method: In this study, 131 cases of proved stroke of either sex from age of 15 to 88 year were included for analysis of their month and season of onset, and types of stroke.
Results: Of total 131 cases, Ischemic stroke accounts 64.9 %(85) while hemorrhagic stroke 35.1 % (46). Males were 58% (76) and females 42% (55) with male to female ratio 1.3:1. Mean age was 57.8 years, majority of patients 70(53.4%) were of 41 to 60 years of age group, where ischemic and hemorrhagic types were more common. In Spring 33(25.2%) case were recorded, in summer 34 (26.0%), in autumn 48 (36.6%) and in winter 16(12.2%) cases. Maximum numbers of stroke cases were recorded in month of September and minimum in February and December.
***Conclusion*:** In our study, there was no statistically significant evidence of association between stroke types and season of a year, however highest numbers and percentage of ischemic stroke ware recorded in month of September, November and December respectively while highest numbers of hemorrhagic stroke were in month of July.

Key words: Stroke Types, Season, Month

INTRODUCTION

Stroke is a clinical condition characterized by sudden onset of focal neurological deficit of vascular in origin. It is a medical emergency and can cause permanent neurological damage, and death. It is a third leading cause of death,[1] and first leading cause of disability in united states,[2] despite of decline in incidence of stroke in last 30 years.[3] It was also fifth leading cause of loss of productivity, in 1990 stroke caused 38.5 million disability adjusted life years.[4]
Worldwide about 15 million people suffer a stroke, of these 5 million die and another 5 million are left permanently disabled, placing a burden on family and community. Annual incidence is between 180 and 300 per 100 000, and about one-fifth of patients with an acute stroke will die within a month of the event, and at least half of those who survive will be left with physical disability.[1] Male are at high risk for stroke than female, risk increases with age (for ischemic type). Mean age of stroke varies from 52 to 66 years.[5] various hospital based studies report high frequency of stroke in males as compared to females.[6,7]
In United States Stroke causes 200,000 deaths each year, its incidence increases with age and is postulated that, the number of stroke and its related deaths will be doubled in year 2030.[8] Incidence for first time stroke is more than 700,000 per year, of which 20% of these patients will die within first year after stroke. At current rate, this number is projected to rise to 1 million per year by the year 2050.[9]
Though the incidence is falling in western countries, but is rising in south Asian countries (India, Pakistan, Bangladesh, and Sirilanka) In Pakistan there are no large-scale epidemiological studies

to determine true incidence of stroke. Estimated annual incidence is 250/100,000, translating 350,000 new cases every year. [10]

Prevalence of stroke in adult pushtoon community residing in Karachi is 4.8% which is alike in men and women.[11] The reported frequency of young stroke (15-45 years) is 26% in study of Khan JA et al,[12] 34% by Vohra et al,[7] and 28% by Syed et al.[6]

Stroke is classified in to Transient ischemic attack (TIA), Progressing stroke (or stroke in evolution) and Completed stroke each may be Ischemic or hemorrhagic type. The clinical presentation of stroke is highly variable depends on site of brain damage and vessel involvement. Hemorrhagic stroke accounts for 15 – 20 % of all stroke, the morbidity is more severe and mortality rates are higher for hemorrhagic than ischemic stroke, only 20% of patients regain functional independence.[13] The 30 days mortality rate is 40-80% and approximately 50% of all deaths occur within first 48 hours.[13] The mortality depends on size and location of hemorrhage, large volume at presentation, growth of hematoma, presents of blood in ventricles and low Glasgow coma score.[14] Treatment of intracranial hemorrhage consists of supportive care and gradual reduction of blood pressure.

Ischemic stroke accounts for about 80 to 85%, caused by thrombotic or embolic blockage of vessel, most commonly occurring during early morning and in cold weather,[15] the risk factors include Advanced age, High blood pressure, Heart disease (atrial fibrillation, heart failure, endocarditis), Diabetes mellitus, Hyperlipidemia, Smoking, Excess alcohol consumption, Polycythemia, elevated serum homocysteine level, Oral contraceptives.[16] Pregnancy, infections, and vasculitis are important etiological factors in young stroke patients.[12] Treatment includes early general supportive measures, antiplatelet, statin, and Recombinant tissue plasminogen activator (rt-PA) is the only proven therapy for acute ischemic stroke, should be considered when a non-hemorrhagic ischemic infarct has been demonstrated and infectious etiologies are excluded and administration of rt-PA must commence within 3 hours of stroke onset.

A season is a division of the year, marked by changes in weather, ecology, and hours of day light. These changes occur because of revolution of earth around the sun and the tilt of earth's axis relative to the plane of revolution. In the temperate and sub polar regions, generally four calendar-based seasons are recognized; spring, summer, autumn, and winter.

Seasons are classified by main four methods; Meteorological, Astronomical, Ecological, and traditional. The Meteorological seasons are reckoned by temperature, the spring season begins on the first March, summer on first June, autumn on first September, and winter on first December. In 1780, the Societas Meteorological Palatine, an early international organization of meteorology, defined seasons as groupings of three whole months. Therefore, spring season consists of March, April and May, summer season consists of June, July, and August, autumn season consists of September, October, and November, while winter season consists of December, January, and February. Ever since professional meteorologists, all over the world have used this definition,[17] in our study, Meteorological classification was used.

Many physicians feel that meteorological conditions influence the onset of stroke.

Existence of seasonal pattern of stroke remains controversial; many studies conducted in different countries throughout the world, including Europe, Asia, Australia, and North America, report an association.[18,19]. Some studies demonstrated that stroke, intra cerebral hemorrhage in particular, occurs most frequently in winter.[19], [20] It was reported that the incidence of ischemic stroke peaked in colder period of a year (winter),[21,22] while others demonstrated that ischemic stroke increased during the warmer months.[23] However other studies show no evidence supporting seasonal variation of stroke. [24,25]

MATERIAL AND METHOD

After approval of ethical committee of hospital, this cross sectional study was conducted at medical unit one of Chandka Medical College Teaching Hospital Larkana in one year period, from March 2009 to February 2010. In this study, 131 cases of proved stroke (clinically and by computerized tomography scan of brain) of either sex of age, more than 12 years were included after getting their written consent.

On the first visit, the patient's detailed history was taken; particularly smoking habits, hypertension, diabetes mellitus, ischemic or valvular heart disease, contraceptive drugs, joint pain and rashes. Thorough interrogation was made about symptoms (weakness of limbs, speech difficulty, and sudden impaired vision, altered level of consciousness, ataxia, vertigo, vomiting, fits and fever).

A detailed general and systemic examination was carried out with special regard to pulse, temperature, blood pressure, jugular venous pressure, xanthoma, xanthelasmia. Central nervous system was specially looked for Glasgow coma score, fundoscopy, and other cranial nerves, weakness of limbs, response of deep tendon reflexes and planter response, signs of meningeal or cerebellar involvement and peripheral sensations where feasible. Respiratory system was examined for signs of fluid aspiration, and consolidation. Cardiovascular system was examined for arrhythmia and valvular lesion. All the findings were entered in self-designed pro forma.

Following patients were excluded from study, Patients having Transient ischemic attack, Syncopal attack, Presumptive diagnosis of stroke with equivocal neurological deficits but no lesion on CT scan brain, patients not willing for brain CT (computerized tomography) scan, neurological deficits secondary to epilepsy, head injury, an infective, and metastatic etiology.

After history and examination, investigation were carried out specially complete blood picture, erythrocyte sedimentation rate, blood sugar, urea and creatinine levels, lipid profile, uric acid level, electrocardiogram, Doppler study for carotids, chest x-ray, echocardiography, and brain computerized tomography. Finally, data was analyzed on SPSS version 17, and chi square test was applied to find out statistically significant association of stoke types and seasons of a year.

RESULTS

In present study of total 131 cases, males were 76(58%) and females 55(42%) with male to female ratio 1.3:1. Table 1. Age of stroke onset, ranged from 21 to 88 years of age, mean age was 57.8 years. Peak age of incidence was 60 years. Majority of patients 70 (53.4%) were of 41 to 60 years of age group, where ischemic and hemorrhagic stroke was more common. Table 2

Of total 131 cases, in Spring 33(25.2%) case were recorded, in summer 34 (26.0%), in autumn 48 (36.6%) and in winter 16(12.2%) cases were recorded. Table 3.

1. Among 33 cases in spring, 19 (57.6%) were ischemic type and 14 (42.4%) were hemorrhagic type. 23 (69.69%) were male and 10(30.30%) were female with male to female ratio 2.3:1 Table 3.
2. Among 34 cases of summer, 19(55.9%) were ischemic type and 15(44.1%) were hemorrhagic type. 21(61.76%) were male and 13(38.23%) were female with male to female ratio 1.6:1 Table 3.
3. Among 48 cases of autumn, 36(75%) were ischemic type and 12(25%) were hemorrhagic type. 27 (56.25%) were male and 21(43.75%) were female with male to female ratio 1.2:1 Table 3.

4. Among 16 cases of winter, 11(68.8%) were ischemic type and 5 (31.2%) were hemorrhagic type. 5(31.25%) were male while 11(68.75%) were female, with male to female ratio 0.45:1. Table 3.

Ischemic stroke accounts 64.9 %(85) while hemorrhagic stroke 35.1 %(46) Table. 1

Among 85 cases of ischemic stroke, 36 (42.4%) occurred in autumn, 19 (22.4%) in spring and summer, and 11(12.9%) in winter. Table. 3

Among 46 cases of hemorrhagic stroke, 15(32.6%) were in summer, 14(30.4%) in spring, 12 (26.1%) in autumn, and 5(10.9%) in winter. Table. 3

Maximum number of strokes were recorded in month of September (22) and minimum in February and December (5) accounting 16.8% and 3.8% respectively (percentage within the stroke type). Table 4 and 5.

Percentage of ischemic stroke within month was 80% in months of November and December, and hemorrhagic stroke was 61% in month of July, where males and females were equally affected. Table. 5

TABLE. 1 SEX AND TYPES OF STROKE DISTRIBUTION

sex	Number of patients	Percentage
Male	76	58.0
Female	55	42.0
Types of stroke		
Ischemic	85	64.9
Hemorrhagic	46	35.1

DISCUSSION

Males are at high risk for stroke than females, risk increases with age (for ischemic type).

In our study males are affected more than females, which correlate with the local studies of Syed NA et al. [6] and Vohra EA, et al.[7] The mean age of stroke was 57.8 years which correlates with the study of Bhojo A, et al.[5] The most commonly affected age group was 41 to 60 years, which correlates with the study of Wang H, et al.[26] It may be speculated that younger people have more chance to work outdoor, exposing themselves to changing environment in comparison to old age people. Stroke of young age group (less than 40 years) constitutes 12.2%, (Table. 2) which does not correlate with other local studies, i.e. 26% in study of Khan JA et al,[12] 34% by Vohra et al,[7] and 28% by Syed et al.[6]

In our study, maximum numbers of cases were admitted in autumn season, and minimum during winter season, because of local traditions and very cold weather in this region so quite few patients manage to reach at this tertiary care unit.

Percentage within the season; of ischemic stroke cases during autumn and winter seasons were 75% and 68.8% while in summer, and spring seasons 55.9% and 57.6% respectively.Table 3. This increased percentage during colder period of a year correlates with study of Spengos K et al,[22] and Wang Y, et al,[27] though statistically (chi-square test) it was not significant. While Percentage within the season; of hemorrhagic stroke during all season is almost uniform, the female percentage was higher in winter season. Table 3.

Highest numbers of ischemic stroke ware found in month of September (16) accounting 18.8%, (percentage within types of stroke). Table 5, among them 10 were male and 6 were female. Table. 7. Percentage of ischemic stroke during month of November and December were 80% each (percentage within months of stroke) Table 5.

The highest numbers of hemorrhagic stroke were found in month of July

TABLE. 2 TYPES OF STROKE IN RELATION TO AGE GROUPS

Age groups			Types of stroke Ischemic	Total Hemorrhagic
	21 to 40	Count	8	8 16
		% within Age group	50.0%	50.0% 100.0%
		% within type of stroke	9.4%	17.4% 12.2%
	41 to 60	Count	50	20 70
		% within Age group	71.4%	28.6% 100.0%
		% within type of stroke	58.8%	43.5% 53.4%
	61 to 80	Count	24	16 40
		% within Age group	60.0%	40.0% 100.0%
		% within type of stroke	28.2%	34.8% 30.5%
	>81	Count	3	2 5
		% within Age group	60.0%	40.0% 100.0%
		% within type of stroke	3.5%	4.3% 3.8%
Total	**Count**	**85**	**46**	**131**
	% within Age group		64.9%	35.1% 100.0%
	% within type of stroke		100.0%	100.0% 100.0%

TABLE. 3 TYPES OF STROKE IN RELATION TO SEASONS OF A YEAR AND SEX DISTRIBUTION

Seasons of a Year	Ischemic Stroke			Hemorrhagic Stroke			Grand Total count
	Males	Females	Total	Males	Females	Total	
Spring	12(24.50%)	7(19.45%)	19(22.35%)	11(40.74%)	3(15.79%)	14(30.43%)	33(25.20%)
Summer	13(26.53%)	6(16.66%)	19(22.35%)	8(29.63%)	7(36.85%)	15(32.60%)	34(25.95%)
Autumn	20(40.81%)	16(44.44%)	36(42.35%)	7(25.93%)	5(26.31%)	12(26.10%)	48(36.64%)
Winter	4(8.16%)	7(19.45%)	11(12.95%)	1(3.70%)	4(21.05%)	5(10.87%)	16(12.21%)
Total count	**49 (100%)**	**36 (100%)**	**85 (100%)**	**27 (100%)**	**19 (100%)**	**46 (100%)**	**131 (100%)**

TABLE 4 PERCENTAGE OF STROKE WITH IN TYPES IN RELATION TO MONTHS AND SEX DISTRIBUTION

Months of a year	Ischemic stroke			Hemorrhagic stroke			Grand Total
count	Male	Female	Total	Male	Female	Total	
January	2(4.1%)	2(5.6%)	4(4.7%)	1(3.7%)	1(5.3%)	2(4.3%)	6(4.6%)
February	1(2.0%)	2(5.6%)	3(3.5%)	0(0%)	2(10.5%)	2(4.3%)	5(3.8%)
March	3(6.1%)	4(11.1%)	7(8.2%)	6(22.3%)	1(5.3%)	7(15.2%)	14(10.7%)
April	6(12.2%)	3(8.3%)	9(10.6%)	3(11.1%)	1(5.3%)	4(8.7%)	13(9.9%)
May	3(6.1%)	0(0%)	3(3.5%)	2(7.4%)	1(5.3%)	3(6.5%)	6(4.6%)
June	5(10.2%)	0(0%)	5(5.9%)	2(7.4%)	0(0%)	2(4.3%)	7(5.3%)
July	3(6.1%)	2(5.6%)	5(5.9%)	4(14.8%)	4(21.1%)	8(17.4%)	13(9.9%)
August	5(10.2%)	4(11.1%)	9(10.6%)	2(7.4%)	3(15.8%)	5(10.9%)	14(10.7%)
September	10(20.4%)	6(16.7%)	16(18.8%)	5(18.5%)	1(5.3%)	6(13.6%)	22(16.8%)
October	3(6.1%)	5(13.9%)	8(9.4%)	1(3.7%)	2(10.5%)	3(6.5%)	11(8.4%)
November	7(14.3%)	5(13.9%)	12(14.1%)	1(3.7%)	2(10.5%)	3(6.5%)	15(11.5%)
December	1(2.0%)	3(8.3%)	4(4.7%)	0(0%)	1(5.3%)	1(2.2%)	5(3.8%)
Total count	**49 (100%)**	**36 (100%)**	**85 (64.9%)**	**27 (100%)**	**19 (100%)**	**46 (35.1%)**	**131(100%)**

(8) accounting 17.4% (percentage within types of stroke). Table 5, it correlates with a Turkish study by Anlar O, et al.[28]

CONCLUSION

In our study, there was no statistically significant evidence of association between stroke types and seasons of a year, however highest numbers of ischemic stroke ware found in month of September and highest numbers of hemorrhagic stroke were found in month of July. Highest percentage of ischemic stroke was recorded in month of November and December.

RECOMMENDATIONS:

Studying the relation between incidence of stroke and weather is difficult because of gross variation in environmental temperature between countries and their regions, so it requires large-scale community based regional data collection.

REFERENCES:

1. Cram, D.L, Maesner, A.T, Witmore, D.M., 1992. Medication refill clinic: *The* veterans administration medical center experience. *J pharm pract.* 5(1), 12-21
1. Davidson's principles and practice of medicine; 20th ed. cerebrovascular disease, 1200 - 10
2. U.S. Centers for Disease Control and Prevention and the Heart Disease and Stroke Statistics - *2007 Update, published by the American Heart Association. Accessed September 2008.*
3. Stephen J. Mc Phee, Maxine A. Papadakis. CMDT 2010: Stroke, 888 - 94
4. Adams HP Jr. Guidelines for the management of patients with acute ischemic stroke: a synopsis. A Special Writing Group of the Stroke Council, American Heart Association. Heart Dis Stroke. Nov-Dec 1994;3(6):407-11.

TABLE 5. PERCENTAGE OF STROKE TYPES WITH IN MONTH

Month of a year	Ischemic stroke	Hemorrhagic stroke	Total number
January	4 (66.7%)	2 (33.3%)	6 (100%)
February	3 (60%)	2 (40%)	5 (100%)
March	7 (50%)	7 (50%)	14 (100%)
April	9 (69.2%)	4 (30%)	13 (100%)
May	3 (50%)	3 (50%)	6 (100%)
June	5 (71%)	2 (29%)	7 (100%)
July	5 (38.46%)	8 (61.54%)	13 (100%)
August	9 (64.2%)	5 (35.8%)	14 (100%)
September	16 (72.7%)	6 (27.3%)	22 (100%)
October	8 (72.7%)	3 (27.3%)	11 (100%)
November	12 (80%)	3 (20%)	15 (100%)
December	4 (80%)	1 (20%)	5 (100%)
Total count	**85 (64.9%)**	**46 (35.1%)**	**131 (100%)**

5. Bhojo A. Khealani, Hameed B, Uzma U, Mapari. J Pak Med Assoc.58(7), July 2008: 400 - 03
6. Syed NA, Khealani BA, Ali S, Hassan A, Akhtar N, Brohi H et al. Ishemic stroke subtypes in Pakistan: the Aga Khan University stroke data bank. J Pak Med Assoc. 2003: 53: 584 – 88
7. Vohra EA, Ahmed WU, Ali M. Aetiology and prognostic factors of patients admitted for stroke. J Pak Med Assoc. 2003; 53: 584 – 88.
8. Wade S, Smith, Joey D. English, S. Claiborne Johnston. Cerebrovascular diseases: Harrison's Principles of Internal Medicine, 17th ed, 2513-35
9. *American Heart Association. 2002 Heart and Stroke Facts Statistical Update. Dallas: American Heart Association; 2001.*
10. www.pakstroke.com. An official website of Pakistan stroke society. Last accessed on April 5, 2008.
11. *Jafar TH, Blood pressure, Diabetes and increased dietary salt associated with stroke results from a community based study in Pakistan. J Hum Hypertens 2006;20:83- 85*
12. *Khan JA, Shah MA. Young stroke: clinical aspects. J coll physicians surg pak 2000; 10:461- 66.*
13. National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. Tissue plasminogen activator for acute ischemic stroke. The National Institute of Neurological Disorders and Stroke rt-PA Stroke Study Group. N Engl J Med. Dec 14 1995; 333(24):1581-7.
14. Hacke W, Kaste M, Bluhmki E, et al; ECASS Investigators. Thrombolysis with alteplase 3 to 4.5 hours after acute ischemic stroke. N Engl J Med. Sep 25 2008; 359(13):1317-29.
15. Spengos K, Vemmos K, Tsivgoulis G, Manios E, Zakopoulos N, Mavrikakis M, et al. Diurnal and seasonal variation of stroke incidence in patients with cardioembolic stroke due to atrial fibrillation. Neuroepidemiology 2003; 22:204-10
16. Tintinalli J, Kellen G, Stapczynski J. Emergency Medicine: A Comprehensive Study Guide. 6th ed. New York: American College of Emergency Physicians. McGraw Hill; 2004:1382-1390.
17. Begin van de lente (Start of Spring), KNMI (Royal Dutch Meteorology Institute), 2009-03-20, http://www.knmi.nl/cms/content/22141/begin_van_de_lente, retrieved 2009-03-20
18. Gill JS, Davies P, Gill SK, et al. wind-chill and the seasonal variation of cerebrovascular disease. J clin Epidemiol 1988; 41:225-30
19. Ricci S, Celani MG, Vitali R, et al. Diurnal and seasonal variation in the occurrence of stroke: a community based study. Neuroepidemiology 1992; 11: 59-64
20. Oberg AL, Ferguson JA, Mc Intyre LA, Horner RD. Incidence of Stroke and season of the year: evidence of an association. Am J Epidemiology, 2000; 152: 558-64.
21. Jakovljevic D, Salomaa V, Sivenius J, Tammine M, Stati C, Salmi K, et al. seasonal variation in occurance of stroke in a Finnish adult population. Stroke,1996; 27: 1774-9
22. Spengos K, Vemmos K, Tsivgoulis G. Diurnal and seasonal variation of stroke incidence in patients with cardioembolic stroke due to atrial fibrillation. Neuroepidemiology. 2003 May – June;22(3):204-10
23. Biller J, Jones MP, Bruno A, Adams Jr HP, Banwart K, Seasonal variation of stroke – does it exist? Neuroepidemiology, 1988; 7: 89-98.
24. Kelly-Hayes M, Wolf PA, Kase CS. Temporal patterns of stroke onset: The Framingham study. Stroke 1995;26:1343-7.
25. Schievink WI, Wijdicks EFM, Meyer FB, et al. Seasons, snow, and subarachnoid hemorrhage: lack of association in Rochester, Miinnesota. J Neurosurg 1995; 82:912-13.
26. Wang H, Sekine M, Chen X, Kagamimori S, A study of weekly and seasonal variation of stroke onset. Int J Biometeorol. 2002 Dec;47(1):13-20
27. Wang H, Levi CR, Attia JR, D'Este CA, Spratt N, Fisher J. Seasonal variation in stroke in the Hunter Region, Australia: a 5 years hospital based study. Stroke 2003 May;34(5):1144-50
28. Anlar O, Tombul T, Unal O, Kayan M. Seasonal and environmental temperature variation in occurrence of ischemic strokes and intracerebral hemorrhage in a Turkish adult population. Int J Neurosci, 2002 Aug;112(8):959-63.