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PREVALENCE AND PROGNOSIS OF CEREBROVASCULAR ACCIDENTS; A CROSS-SECTIONAL STUDY CONDUCTED AT SERVICES HOSPITAL, LAHORE

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ABSTRACT

Cerebrovascular accidents or stroke is an important healthcare concern. Ischemic stroke is an acute neurologic deficit that results from focal cerebral ischemia leading to permanent tissue damage (infarction). The cause is commonly associated with atherothrombotic occlusion of large arteries, cerebral embolism (embolic infarction), non-thrombotic occlusion of small, deep cerebral arteries (lacunar infarction), and proximal arterial stenosis with hypotension that decreases cerebral blood flow in arterial watershed zones (hemodynamic stroke). Stroke is being observed as a rapidly growing problem and an important cause of illness and death in Pakistan. The aims of this cross-sectional study were to establish the prevalence and prognosis of cerebrovascular accidents and its subtypes in Lahore, Pakistan. Data were collected on all patients who experienced CVAs between December 2018–March 2019, used the diagnosis coding program in Services universirty, Lahore, Pakistan. Out of 215 patients 63.7% were male and 36.3% were female. The overall incidence of ischemic stroke after acute myocardial infarction was 85.26%. Hypertension, diabetes mellitus were shows as more risk factors for ischemic stroke type compared with hemorrhagic stroke, and embolic stroke. The overall status of stroke patients were shown 92.1% live and 7.9% were dead. Incidence of complicating hospitalizations with cerebrovascular accident continues to grow and is associated with increased mortality and adverse discharge. This highlights the need for early diagnosis, better risk stratification, and preparedness for need for complex long-term care in this vulnerable population.

INTRODUCTION

Stroke is a major cerebrovascular disease resulting in high mortality and persistent disability in adults across the world. Besides coronary heart disease and cancer, stroke is the commonest cause of death in most industrialized countries.[1] Cerebrovascular accidents (CVAs) are the fifth leading cause of mortality and the leading cause of serious, long-term disability in the United States. Most strokes (87%) are ischemic, caused by thrombotic or embolic occlusion of a major artery.[2] CVA has traditionally been divided into infarcts (embolic or thrombotic) and hemorrhagic lesions based on the pathologic and radiographic appearance. Infarcts are further subdivided into lacunar and cerebral infarcts. Similarly, hemorrhagic lesions are subdivided into intracerebral hemorrhage and subarachnoid hemorrhage (SAH).

CVA or stroke occurs when blood flow to a part of the brain is prevented due to blockage, or rupture of blood vessels.[3] Recent statistics on European cardiovascular diseases indicate that stroke is responsible for 4 million deaths, with over 1.9 million deaths recorded in the European Union.[4] In 75% of the cases, the stroke attack is attributed to blood clot, i.e. ischemic stroke. The remaining cases are attributed to ruptured blood vessel in the brain, i.e. hemorrhagic stroke. The established risk factors, including arterial hypertension, diabetes mellitus, cigarette smoking, micro-vascular rupture, hyperlipidemia, age and observed comorbidity such as sickle cell disease, human immunodeficiency virus/acquired immune deficiency syndrome infection and cerebral malaria are increasingly being encountered in the tropics.[5]

Approximately 90% of CVAs were attributed to 10 risk factors that are preventable (hypertension, regular physical inactivity, high apolipoprotein B/A1 ratio, insufficient diet quality, increased waist/hip ratio, psychosocial factors, current smoking, cardiac causes, heavy alcohol consumption, and diabetes mellitus).[6] Stroke is being observed as a rapidly growing problem and an important cause of illness and death in Pakistan. Therefore, it becomes one of the most imperative social and economic medical issues in the Kingdom.[7] The aims of this cross-sectional study were to establish the prevalence and prognosis of cerebrovascular accidents and its subtypes in Lahore, Pakistan.

MATERIALS AND METHODS

Study design, study setting and subjects

This study was a cross-sectional study. Defining a CVA as an acute complication of certain chronic diseases with clinical manifestations requiring immediate medical care and hospitalization, we collected data on all patients who experienced CVAs between December 2018–March 2019, we used the diagnosis coding program in Services Hospital Punjab, Pakistan to look for any patient who had CVA in the last five years, we found more than 300 patients there were diagnosed with CVA and had been admitted to the hospital for full assessment and management. We started contacting our patients to have their consent to open their medical records and we received 215 consent. We design a collector form to collect our data, we went through their medical history and some specific lab and radiological investigations. All the data obtained were transferred to an appropriate record form (Figure 1). No additional investigations were pursued with the patients' families or with physicians.

Statistics analysis

All the data from record form were entered in a system in the Microsoft Excel table format then the final file was exported to the Statistical Package for the Social Sciences V.23 (SPSS) for analysis. The age of patients were represented in mean and standard deviation. The categorical variables was expressed as total numbers and percentages. Frequency tables were used to present the distribution of nominal variables. Descriptive statistics were used to assess the baseline demographics; they were carried out by calculating the frequencies and percentages. Summaries for groups of cases were calculated and represented in the legacy dialogs bars with a level of 95% confidence intervals (CI).

RESULTS

Overall, 215 cerebrovascular accidents or stroke patients were reported and stratified by sex. Out of 215 patients 121 (63.7%) were male and 69 (36.3%) were female. The average age of patients were 63.68 ± 15.82 years, 62.66 ± 15.99 were male, and 65.48 ± 15.47 were female. Table 1 represents in total number of patients in the cross tabulation of gender with the stroke subtype. The ischemic stroke shows more in male compared with female. Comparatively male CVA patients are almost double compared with female CVA patients.

Figure 2 showed the nationality wise stroke subtypes of patients with CVA Punjab region. To compare with other nationality, 80.53% (47.37% male; 33.16% female) of CVA patients are Pakistani. We found 5.27% (both male and female) of CVA patients were Indians. But the other nationalities showed in less numbers compared with Pakistani. Figure 3 represents the percentage of stroke subtypes of CVA patients Punjab region. The overall incidence of ischemic stroke within 5 months after acute myocardial infarction was 85.26% over the period December 2018 – March 2019. Ischemic stroke was more predominant.

**Figure 1: The model of record form which was filled the collected patient's data.**
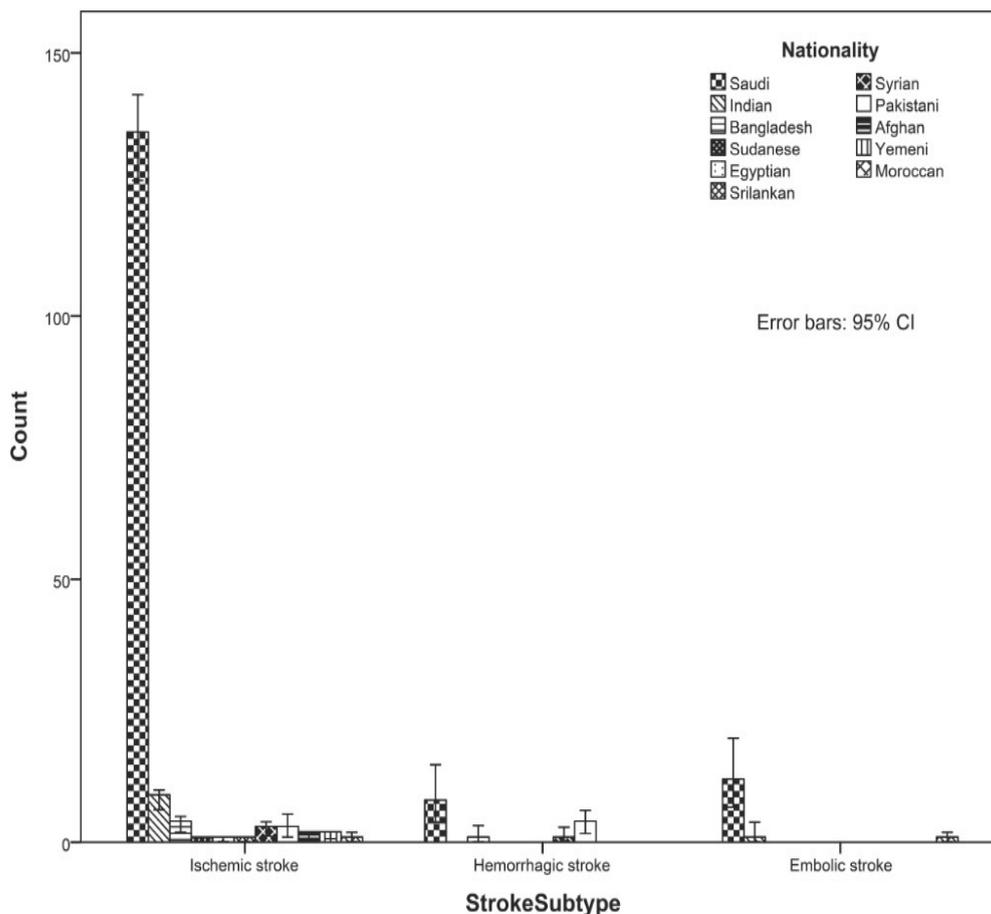
Figure 2: Shows the stroke subtypes of patients with their nationality in Lahore Pakistan.
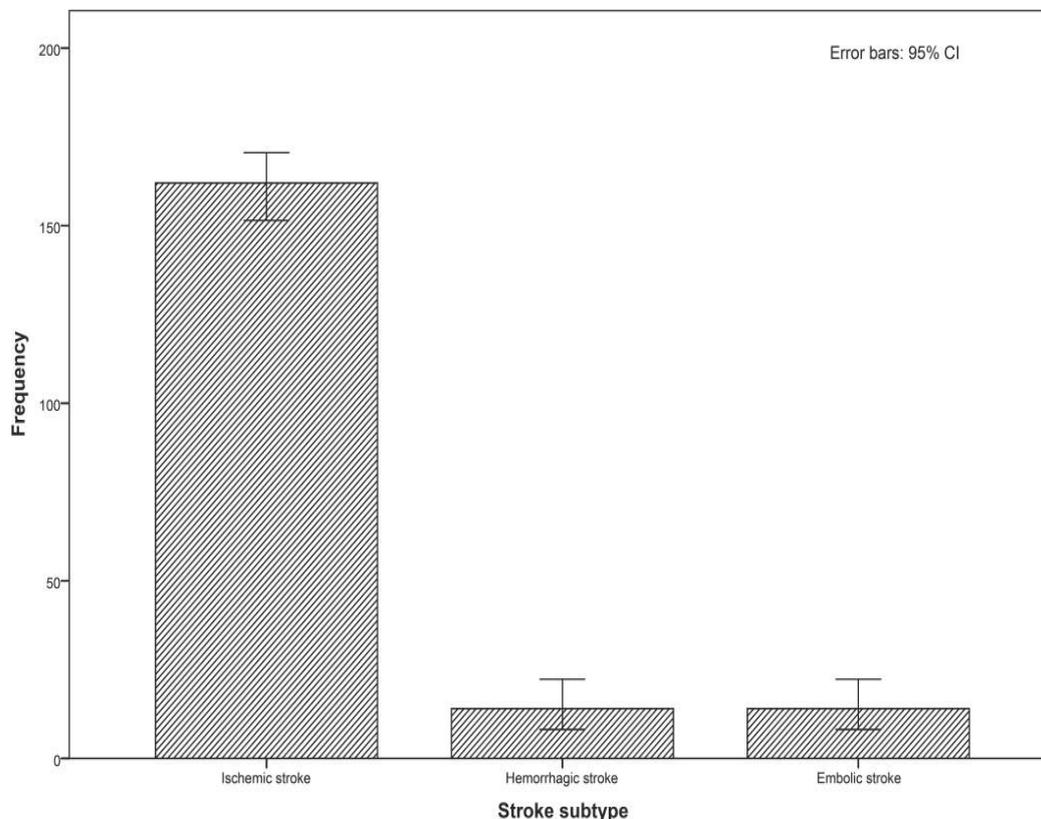

Figure 3: Represents the percentage of stroke subtypes in 215 patients with cerebrovascular accidents from Hail region between December 2018–March 2019.
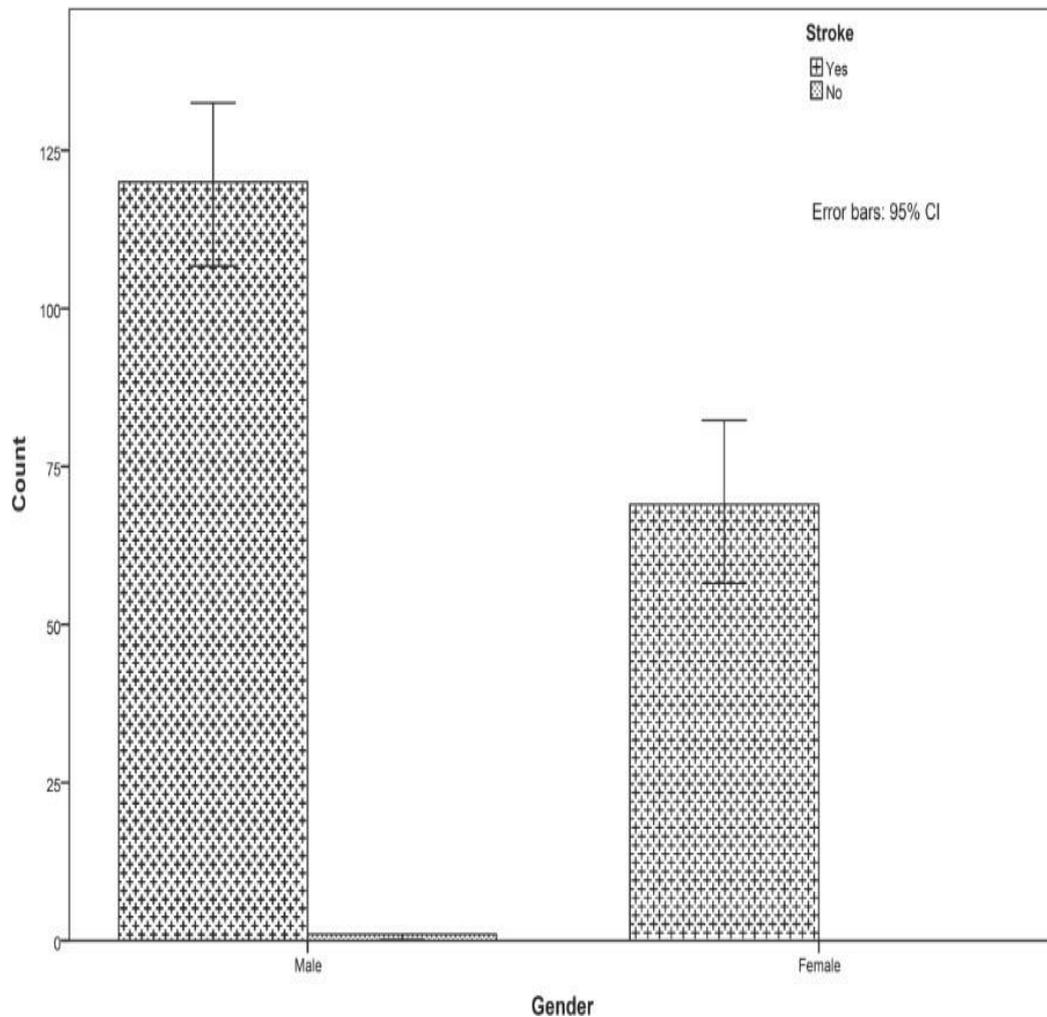
Figure 4: Prevalence of stroke among gender which shows 99.5% had stroke in cerebrovascular accidents patients.

Compared with other subtypes of CVA. But hemorrhagic stroke and embolic stroke were shown an equal percentage (7.37%) of CVA patients.

The prevalence of stroke among gender were shown in Figure 4. Findings from this cross-sectional studies suggest male stroke patients were significantly increased compared with female. 99.5% of patients had stroke, of this 63.16% male and 36.32% female CVA patients. Figures 5-7 showed the prevalence of stroke subtypes with the established risk factors, including arterial hypertension, diabetes mellitus, and cigarette smoking. Hypertension, diabetes mellitus were shows as more risk factors for ischemic stroke type compared with hemorrhagic stroke, and embolic stroke. But cigarette smoking is not a major risk factors for ischemic stroke. From the legacy dialogs bars of stroke subtype in relation to hypertension patients showed 70.53% of ischemic stroke had hypertension but 14.74% showed ischemic stroke without hypertension. The other CVA subtypes like hemorrhagic stroke and embolic stroke had 6.32% and 6.84% of hypertension respectively. Its indicates only 1.05% of hemorrhagic stroke and 0.53% of embolic

stroke patients had CVA without hypertension.

From the Figure 6 showed 63.68% of ischemic stroke, 5.26% of hemorrhagic stroke and 5.26% of embolic stroke patients were not smokers. This indicates smoking is not a major risk factors for stroke. Figure 7 indicates over all 67.37% of CVA patients (all subtypes) had diabetes mellitus which is indicates that the diabetes mellitus is a one of the major risk factor for CVA with stroke.

The association between myocardial infarction and stroke subtype were shown in Figures 8 and 9. Stroke with myocardial infarction were more predominate in ischemic stroke compared with other stroke subtypes. Myocardial infarction than stroke were significantly increased in embolic stroke compared with hemorrhagic stroke. The overall 74.74% of CVA patients showed with myocardial infarction, from this 68.09% of ischemic stroke patients, 23.40% of embolic stroke patients and 2.13% of hemorrhagic stroke patients had MI then stroke. It is indicates that MI also major risk factor for CVA patients.
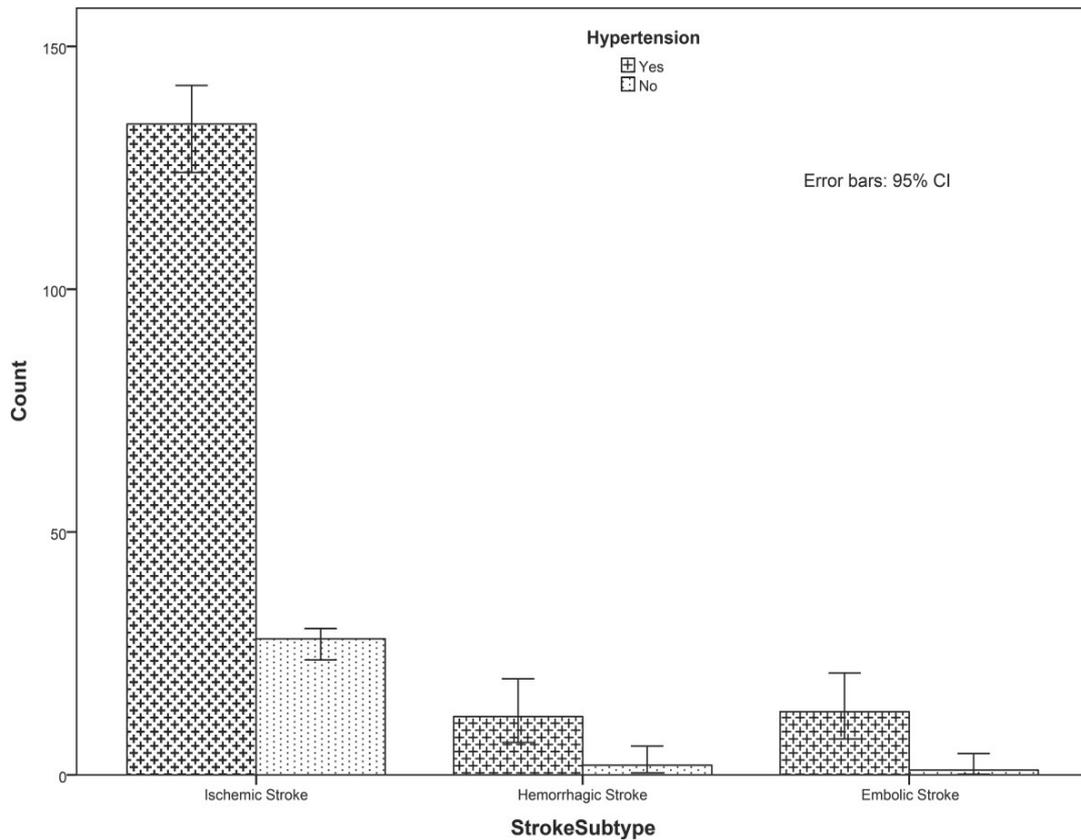
Figure 5: Prevalence of stroke subtype in relation to hypertension patients with cerebrovascular accidents from Hail region.
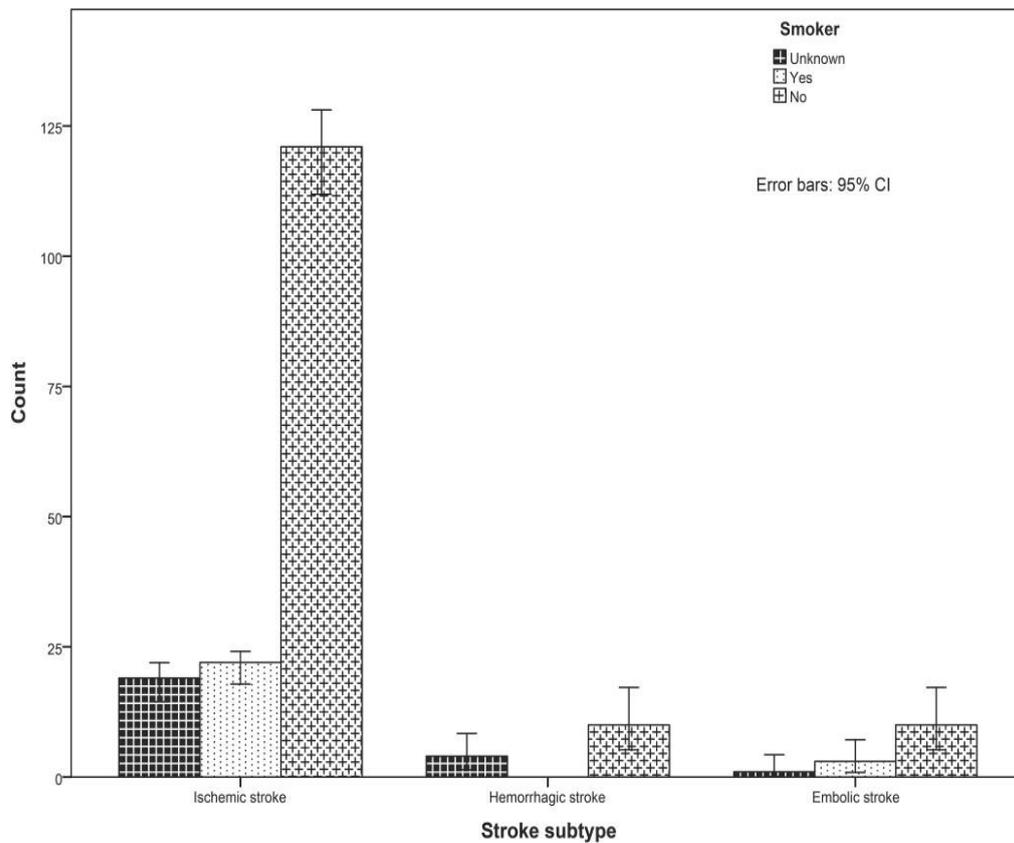
Figure 6: Prevalence of stroke subtype in relation to smokers hypertension patients with cerebrovascular accidents from Hail region in Pakistan.
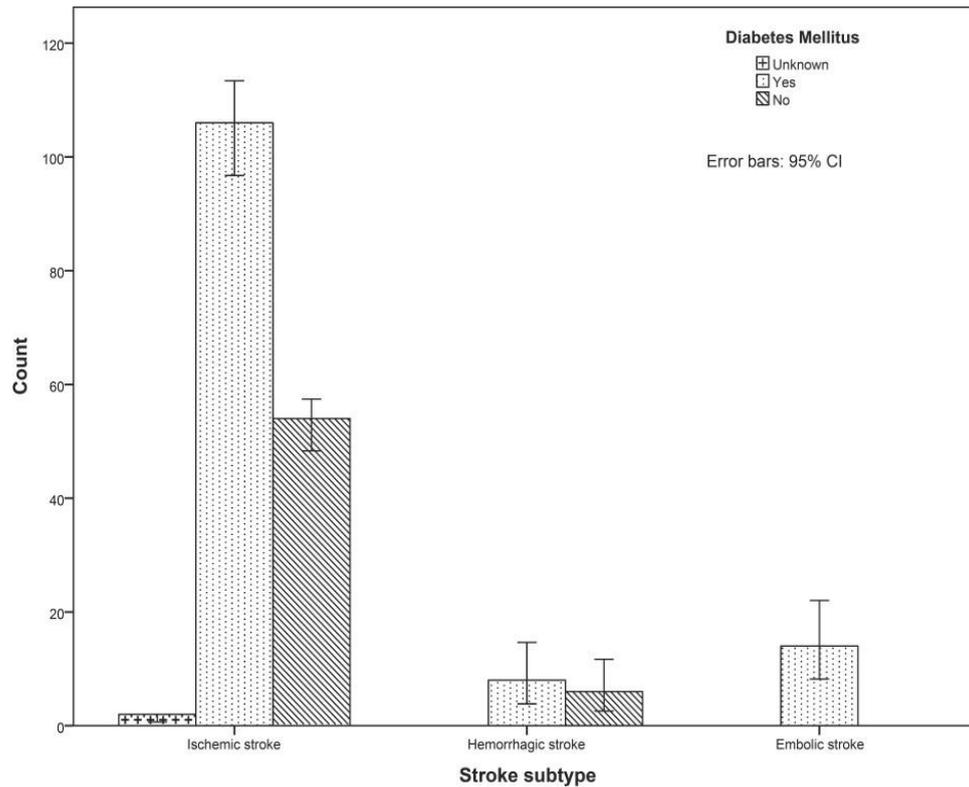
Figure 7: Association of diabetes mellitus with stroke subtype patients with cerebrovascular accidents from Hail region in Pakistan. [55.79%-ischemic stroke with DM; 4.21% - hemorrhagic stroke with DM and 7.37% - embolic stroke with DM].
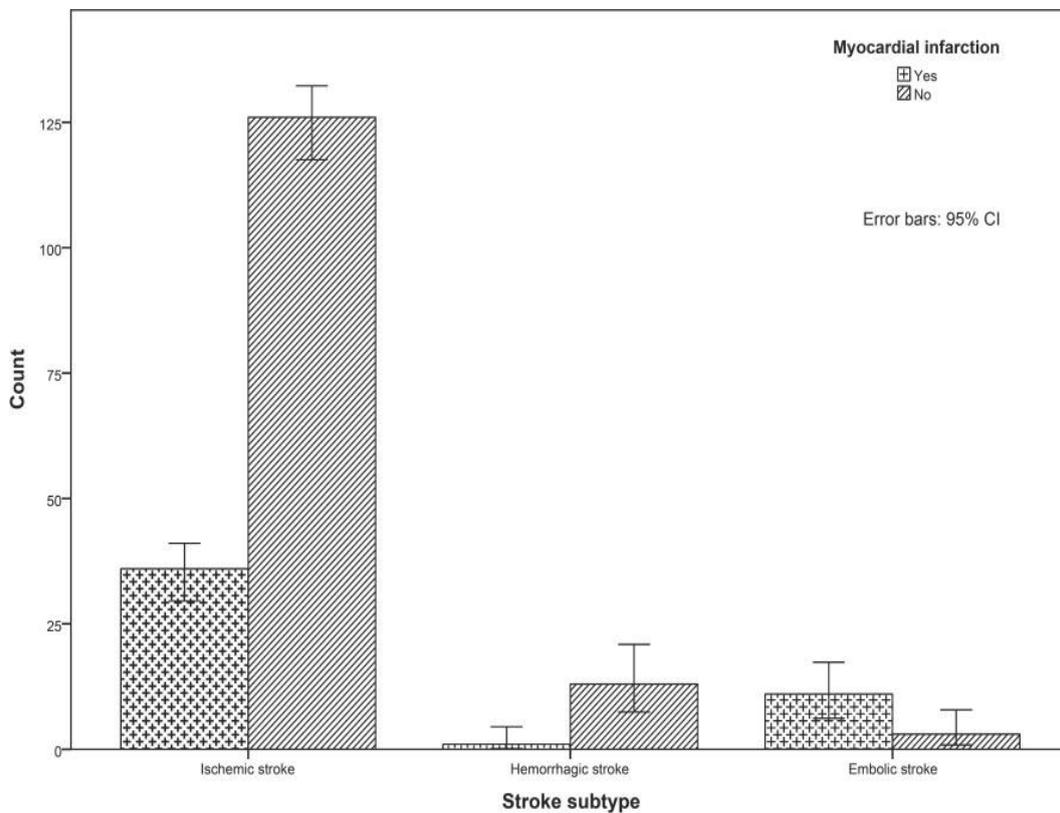
Figure 8: The prevalence and prognosis of stroke subtypes with myocardial infarction patients with cerebrovascular accidents from Hail region in Pakistan. [18.95% ischemic stroke with MI; 66.32% ischemic stroke without MI; 0.53% hemorrhagic stroke with MI; 6.84% hemorrhagic stroke without MI; 5.79% embolic stroke with MI; 1.58% embolic stroke without MI].

Table 1: Shows the cross tabulation of gender with the stroke subtype of patients Punjab region.

Gender	Stroke Subtype			Total
	Ischemic	Hemorrhagic	Embolic	
Male	100	11	10	121
Female	62	3	4	69
Total	162	14	14	215
Data are represented as in numbers of patients with cerebrovascular accidents and its subtypes				

Table 2: Shows the cross tabulation on status of the CVA patients with their stroke subtype.

CVA Patients			Status	
			Live	Dead
Stroke subtype	Ischemic stroke	Count	148	14
		% of Total	77.9%	7.4%
	Hemorrhagic stroke	Count	14	0
		% of Total	7.4%	0.0%
	Embolic stroke	Count	13	1
		% of Total	6.8%	0.5%
Total		Count	175	15
		% of Total	92.1%	7.9%
Data are represented as status of patients in numbers and percentage with cerebrovascular accidents and its subtypes.				
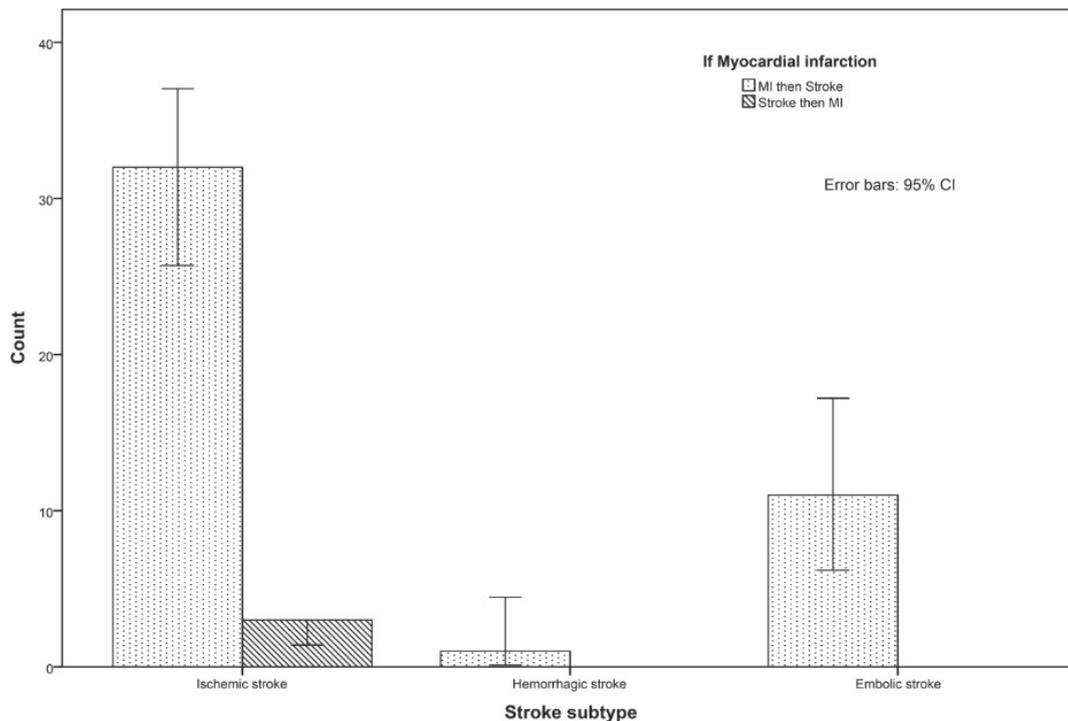
**Figure 9: The association between myocardial infarction and stroke subtype patients with cerebrovascular accidents from Hail region in Pakistan. [ischemic stroke: 68.09% MI then stroke and 6.38% stroke then MI; hemorrhagic stroke: 2.19% MI then stroke and No stroke then MI; embolic stroke: 23.40% MI then stroke and No stroke then MI].**

Stroke patients were live. The overall status of stroke patients were shown 92.1% live and 7.9% were dead approximately during the period of 2016 to 2018.

DISCUSSION

Cerebrovascular disorders are common conditions leading to significant morbidity and mortality in the population. The generally recognized importance of cerebrovascular accidents (CVAs) as a cause of death has prompted the World Health Organization to sponsor centers in Europe, Asia, and Africa to study this problem.[8] Both CVA incidence and the mortality resulting from CVAs exhibit wide geographic variations, even within a single country,[8-12] variations that have not yet been satisfactorily explained.[11,13]

The largest country in the Middle East is Pakistan, occupies nearly four-fifths of the Arabian Peninsula with more than 28 million population. In Pakistan, yearly 22% of deaths occurs by CVD.[14] But the current data on

stroke in the Pakistan are lacking.[15] The prevalence of stroke in Pakistan is more intricate to estimate precisely. A prevalence of 178 out of 100,000 was reported in a community based survey from the Eastern region of Pakistani.[16,17] Compare with Western countries, the Pakistan has the lower rates in the incidence and prevalence of stroke.

In 2007 reported that a major percentage of the patients had not even heard the term "stroke" in the Gulf Cooperation Council (GCC) countries.[18] Obesity, smoking, sedentary lifestyle, etc are the risk factors for stroke. A study indicates in Pakistan that prevalence of stroke among men than women.[19] In another study showed interviewed neurologists about their views on stroke, reports that acute stroke care in Pakistan as inadequate.[20]

In 2012 a study reported an alarming deficit in the level of stroke awareness in the Pakistani population.[21] Stroke was more frequent in the sixth decade of life with male predominance in both Pakistanis and non-Pakistanis.[22-24]

Across middle east, in Qatar the incidence rate for all strokes 63/100,000 population. But in Libya, the incidence rates for hemorrhagic stroke were 2.7/100,000. Pakistan showed 1.9/100,000 stroke incidence and 10.4/100,000 in Iran.[26] The study from Majmaah Province, Pakistan indicates that non- cardioembolic disease was the overwhelming stroke mechanism in this middle-eastern cohort with only 4% of patients have cardioembolic stroke, in comparison to roughly 20% reported in Western cohorts. Further, 59% of the cohort had concurrence of hypertension and diabetes mellitus.[27] This indicates that the major risk factors for CVA are hypertension and diabetes mellitus showed in our study Figures 5 and 7.

The present study describes several notable findings. We observed that patients with CVA are not at an increased risk of stroke death, as compared to age, and sex. The prevalence of cerebrovascular accident (CVA) or stroke is increasing in frequency amongst the general population due to increased prevalence of diabetes and hypertension.[28] Stroke poses the risk of immediate mortality and long-term morbidity in the survivors with residual disability. The commonest underlying etiology of the CVA is vascular occlusion leading to infarction of brain.[29] Hemorrhagic stroke is less frequent than ischemic stroke and is due to aneurysmal rupture or malignant hypertension.[30]

In general, elevated sugar (Figure 7), LDL-cholesterol, hypertension (Figure 5), and cigarette smoking (Figure 6) are strongly associated with an increased risk of myocardial infarction and CVA. The increasing incidence of hypertension with age had already been described before.[31-37] Hemorrhagic stroke is a rare but serious complication after an acute myocardial infarction (AMI). But the overall incidence of ischemic stroke within 5 months after acute myocardial infarction was 85.26% over the period December 2018-March 2019 in Lahore Pakistan. Ischemic stroke was more predominant compared with other subtypes. The hemorrhagic stroke and embolic stroke were shown an equal percentage (7.37%) of CVA patients. Patients with hemorrhagic stroke have higher short-term mortality, but ischemic stroke patients have a significant long-term disability and morbidity.[38]

In the present study, the risk of CVA in patients with diabetes mellitus was 55.79% of ischemic stroke, 40% of hemorrhagic stroke and 7.37% of the CVA were embolic stroke. Although the incidence of CVA was higher in adult patients with ischemic stroke, we did not find a strong prediction from age and sex. We demonstrated that hypertension was the most significant predictor for CVA. Despite a wide variety of risk factors described for CVAs,[39] hypertension is generally accepted as the principal predisposing factor.[40] From this study, several insights and recommendation for improving care extended to stroke patient can be derived.

CONCLUSION

In conclusion we demonstrated that diabetic and hypertensive patients have higher mortality after incident stroke, but sex and age was not an independent risk factor. Incidence of complicating hospitalizations with cerebrovascular accident continues to grow and is associated with increased mortality and adverse discharge. This highlights the need for early diagnosis, better risk stratification, and preparedness for need for complex long-term care in this vulnerable population.

REFERENCES

1. Sims NR, Muyderman H. Mitochondria, oxidative metabolism and cell death in stroke. Biochim Biophys Acta, 2010; 1802(1): 80–9.
2. Shivaraju A, Yu C, Kattan MW, et al. Temporal trends in percutaneous coronary intervention–associated acute cerebrovascular accident (from the 1998 to 2008 Nationwide Inpatient Sample Database). Am J Cardiol, 2014; 114: 206-13.
3. Korn-Lubetzki I, Farkash R, Pachino RM, et al. Incidence and risk factors of cerebrovascular events following cardiac catheterization. J Am Heart Assoc.,2013; 2: e000413.
4. Nichols J, Townsend N, Luengo-Fernandez R, et al. European cardiovascular disease statistics. Brussels, Sophia Antipolis: European Heart Network and European Society of Cardiology, 2012.
5. Benamer HT, Grosset D. Stroke in Arab countries: A systematic literature review. J Neurol Sci., 2009; 284(1-2): 18–23.
6. O'Donnell MJ, Chin SL, Rangarajan S, et al. Global and regional effects ofpotentiallymodifiable risk factors associated with acute stroke in 32 countries (INTERSTROKE): A case- control study. Lancet, 2016; 388(10046): 761–75.

7. Al-Jadid MS, Robert AA. Determinants of length of stay in an inpatient stroke rehabilitation unit in Pakistan. Pakistani Med J., 2010; 31(2): 189–92.

8. World Health Organization. Cerebrovascular diseases: Prevention, treatment, and rehabilitation. WHO Technical Report Series, No. 469. Geneva, 1971.

9. Aho K, Harmsen P, Hatano S, et al. Cerebrovascular disease in the community: Results of a WHO collaborative study. Bull WHO., 1980; 58(1): 113-30.

10. Borhani NO. Changes and geographic distribution of mortality from cerebrovascular disease. Am J Public Health, 1965; 55(5): 673-681.

11. Marquardsen J. The epidemiology of cerebrovascular disease. Acta Neurol, 1978; 57: 57-75.

12. Richard J. Epidemiology of hypertension and stroke in Europe and the mediterranean countries. In: S. Hatano, Shigematsu, and T. Strasser (eds.). Hypertension and stroke control in the community: Proceedings of a WHO meeting held in Tokyo, 11-13 March 1974. World Health Organization, Geneva, 1976; 60-78.

13. Hatano S. Experiences with community strokes registers. In: S. Hatano, I. Shigematsu, and T. Strasser (eds.). Hypertension and stroke control in the community: Proceedings of a WHO meeting held in Tokyo, 11-13 March 1974. World Health Organization, Geneva, 1976; 117-28.

14. Robert A, Zamzami MM. Stroke in Pakistan: A review of the recent literature. The Pan African Medical Journal, 2014; 17: 14

15. Alahmari K. Prevalence of stroke in kingdom of Pakistan - Through a physiotherapist diary. Mediterranean Journal of Social Sciences, 2016; 7(1): 228-33.

16. Al-Rajeh S, Awada A. Stroke in Pakistan. Cerebrovasc Dis., 2002; 13(1): 3-8.

17. Awada A. Primary and secondary prevention of ischemic stroke. J Med Liban, 2011; 59(4): 213-9.

18. Kamran S, Bener AB, Deleu D, et al. The level of awareness of stroke risk factors and symptoms in the Gulf Cooperation Council countries: Gulf Cooperation Council stroke awareness study. Neuroepidemiology, 2007; 29(3-4): 235-42.

19. Yaqub BA, Shamena AR, Kolawole TM, et al. Cerebrovascular disease in Pakistan. Stroke, 1991; 22(9): 1173-6.

20. Al-Khathaami AM, Algahtani H, Alwabel A, et al. The status of acute stroke care in Pakistan: An urgent call for action. Int J Stroke, 2011; 6(1): 75-6.

21. Al-Aqeel A, Al-Ammari B, Alsyefi N, et al. Stroke awareness in the Pakistan Community: Prompt Public Health Measures Must Be Implement, 2012.

22. Akbar D, Mushtaq M, Quaboos S. Clinical profile of stroke at King Abdulaziz University hospital. Journal for Scientific Research, 2001; 1: 35- 38.

23. Al-Jishi AA, Mohan PK. Profile of stroke in Bahrain. Neurosiences, 2000; 5: 30–4.

24. Awada A, Rajeh S. The Pakistani stroke data bank: Analysis of the first 1000 cases. Acta Neurol Scand, 1999; 100(4): 265-9.

25. Qari FA. Profile of stroke in a teaching university hospital in the western region. Pakistani Med J., 2000; 21(11): 1030-3.

26. Tran J, Mirzaei M, Anderson L, et al. The epidemiology of stroke in the Middle East and North Africa. J Neurol Sci., 2010; 295(1-2): 38-40.

27. Al-Harbi A, Shoamanesh A. Stroke subtypes and risk factors in Pakistan. Neurology, 2016; 86 (16): 124.

28. Allen CL, Bayraktutan U. Risk factors for ischaemic stroke. Int J Stroke, 2008; 3: 105-16.

29. Stürmer T, Schlindwein G, Kleiser B, et al. Clinical diagnosis of ischemic versus hemorrhagic stroke: Applicability of existing scores in the emergency situation and proposal of a new score. Neuroepidemiology, 2002; 21: 8-17.

30. Sundquist K, Li X, Hemminki K. Familial risk of ischemic and hemorrhagic stroke: A large-scale study of the Swedish population. Stroke, 2006; 37: 1668-73.

31. Webb G. Treatment of coarctation and late complications in the adult. Semin Thorac Cardiovasc Surg, 2005; 17: 139e142.

32. Brown ML, Burkhart HM, Connolly HM, et al. Coarctation of the aorta: Lifelong surveillance is mandatory following surgical repair. J Am Coll Cardiol, 2013; 62: 1020e1025.

33. Roche SL, Silversides CK. Hypertension, obesity, and coronary artery disease in the survivors of congenital heart disease. Can J Cardiol, 2013; 29: 841e848.

34. O'Sullivan JJ, Derrick G, Darnell R. Prevalence of hypertension in children after early repair of coarctation of the aorta: A cohort study using casual and 24-hour blood pressure measurement. Heart, 2002; 88: 163e166.

35. Chiu HH, Chiu SN, Hu FC, et al. Late cardiovascular complications after surgical or balloon angioplasty of coarctation of aorta in an Asian cohort. Am J Cardiol, 2009; 104: 1139e1144.

36. Hager A, Kanz S, Kaemmerer H, et al. Coarctation Long- term Assessment (COALA): Significance of arterial hypertension in a cohort of 404 patients up to 27 years after surgical repair of isolated coarctation of the aorta, even in the absence of restenosis and prosthetic material. J Thorac Cardiovasc Surg, 2007; 134: 738e745.

37. Moltzer E, Mattace-Raso FU, Karamermer Y, et al. Comparison of candesartan _vs._ metoprolol for treatment of systemic hypertension after repaired aortic coarctation. Am J Cardiol, 2010; 105: 217e222.

38. Bamford J, Sandercock P, Dennis M, et al. Classification and natural history of clinically identifiable subtypes of cerebral infarction. Lancet, 1991; 337: 1521-6.

39. Neuman J, Mettinger KL, Soderstrom CE. Stroke in males before 55: A study of 206 patients. Acta

Nemol scand, 1978; 57-222.
40. Svenius J, Pyr-Blalill K, Riekkinen PH, et al. The incidence of stroke in Kuopio area, Finland. Acta Neural Scand, 1980; 62: 193.