



STUDY OF ELECTROCARDIOGRAM AND 2-DIMENSIONAL TRANSTHORACIC AND DOPPLER ECHOCARDIOGRAM IN PATIENTS WITH ACUTE ISCHEMIC STROKE

Dr. Rucha Rajesh Shetti¹, Dr. Vasant Deokar^{2*}, Dr. Aparna Patange³, Dr. Jabbar Desai⁴, Dr.Sushrut patil⁵, Dr.Saketh Reddy⁶

Article History: Received: 12.12.2022

Revised: 29.01.2023

Accepted: 15.03.2023

Abstract

Stroke is the second leading cause of death globally and is associated with up to 5.54 million deaths every year, two thirds of which occur in resource poor countries. Cerebro vascular accident also called as stroke is defined as the sudden onset of neurological deficit that can be attributable to a focal vascular cause. Acute ischemic stroke is characterized by the sudden loss of blood circulation to an area of brain, resulting in a corresponding loss of neurologic function. Acute ischemic stroke is caused by thrombotic or embolic occlusion of a cerebral artery. Clinical stroke scores are proposed to differentiate between stroke subtypes but their reliability is unknown. Cerebrovascular Accident or stroke is a major cause of morbidity and mortality. For any treatment to be contemplated it is important to know whether we are dealing with a bleed or an infarct. Aim: To study of Electrocardiogram and 2-Dimensional Transthoracic Doppler Echocardiogram changes in patients with acute ischemic stroke.

Material and methods: The study was conducted at KRISHNA INSTITUTE OF MEDICAL SCIENCES ON 96 patients who inclusive fulfill the criteria's were chosen as study subjects. Patients who are admitted in Intensive Care Unit at Krishna hospital were included in the study. Electrocardiogram and 2-Dimensional Transthoracic Doppler Echocardiogram was assessed in the patients of stroke within 72 hours of admission. After admission a detailed history and clinical examination was carried out in all the cases of acute ischemic stroke. The diagnosis of Acute ischemic stroke was made on the basis of Clinical examination and CT scan of brain of the patients. The collected data was compiled in Microsoft Excel 2010. Data was analyzed using SPSS (Statistical Programme for Social Sciences) software 21 version, OpenEpi Software Version 2.3.

Results: Total 96 patients with acute ischemic stroke were included in this prospective observational study, of which [68 (70.8%)] were males and [28 (29.2%)] were females. This study was predominated by the male gender with a male to female ratio of 2.42:1. A majority of the patients belonged to the age group of 61 to 80 years (43.75%), followed by 41 to 60 years (35.42%). The minimum age of the patients was 22 years, and the maximum age was 62 years.

Conclusion: In present study ST-segment depression and 'T' wave abnormalities were frequent Electrocardiogram abnormalities and as Left Ventricular Dysfunction (LVD) was frequent Echocardiogram abnormalities. This gives clue for risk factors of Atherosclerotic cardiovascular disease (ASCVD) like Hypertension, Diabetes Mellitus for risk stratification strategy. Common risk factor profile for Acute Ischemic Stroke (AIS) and Coronary Artery Disease (CAD) are also easily evaluated by Electrocardiogram and Echocardiogram.

Keywords: Echocardiogram, Electrocardiogram, Doppler, Coronary Artery Disease

^{1,5,6}Junior Resident, Department of Medicine, Krishna Vishwa Vidyapeeth, Deemed to be University Karad, Satara, Maharashtra, India

^{2*}Professor, Department of Medicine, Krishna Vishwa Vidyapeeth, Deemed to be University Karad, Satara, Maharashtra, India

³Associate Professor, Department of Medicine, Krishna Vishwa Vidyapeeth, Deemed to be University Karad, Satara, Maharashtra, India

⁴Assistant Professor, Department of Medicine, Krishna Vishwa Vidyapeeth, Deemed to be University Karad, Satara, Maharashtra, India

DOI: 10.31838/ecb/2023.12.s2.037

1. Introduction

Cerebrovascular Accident or stroke is a major cause of morbidity and mortality. For any treatment to be contemplated it is important to know whether we are dealing with a bleed or an infarct.^[1, 2] It has two main subtypes, ischemic and hemorrhagic. For optimal management, a distinction must be made between the subtypes since the therapy is different.^[3] Ischemic stroke warrants institution of thrombolytic and/or antiplatelet therapy while in hemorrhagic stroke, hemostatic therapy may be given.^[4] Ideally, either thrombolytic or hemostatic therapy should be given soon after the onset of stroke in order to improve outcome.^[5]

Aim: To study of Electrocardiogram and 2-Dimensional Transthoracic Doppler Echocardiogram changes in patients with acute ischemic stroke.

2. Material and methods

The study was conducted at KRISHNA INSTITUTE OF MEDICAL SCIENCES ON 96 patients who inclusive fulfill the criteria's were chosen as study subjects. Patients who are admitted in Intensive Care Unit at Krishna hospital were included in the study. Electrocardiogram and 2-Dimensional Transthoracic Doppler Echocardiogram was assessed in the patients of stroke within 72 hours of admission. After admission a detailed history and clinical examination was carried out in all the cases of acute ischemic stroke. The diagnosis of Acute ischemic stroke was made on the basis of Clinical examination and CT scan of brain of the patients

Inclusion criteria:

- Cases of Acute ischemic stroke (CT scan proved) admitted within 72 hours after the onset of stroke were Selected for the study
 - Those patients who are conscious oriented, willing and give written consent will be participated in the study.
 - Those patients who are unconscious, not oriented for those written consent is given by attender will be participated in the study.
- The collected data was compiled in Microsoft Excel 2010. Data was analyzed using SPSS (Statistical Programme for Social Sciences) software 21 version, OpenEpi Software Version 2.3.

Exclusion criteria

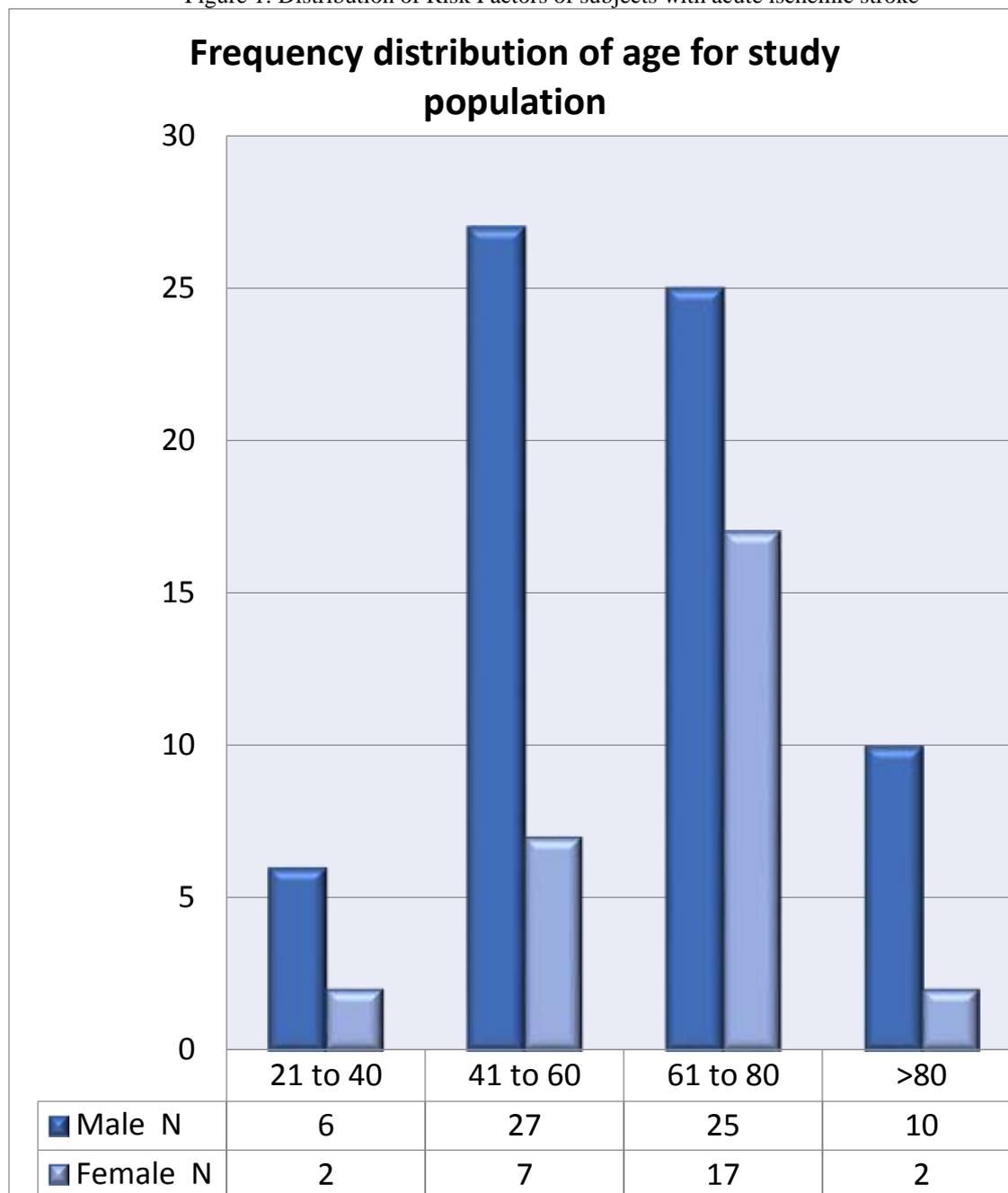
- Traumatic cases producing neurological deficits, infection, neo plastic cases producing Cerebrovascular accident.
- Patients admitted beyond 72 hours after onset of stroke were excluded as the incidence of electrocardiogram changes beyond this period were in frequent.

Ethical clearance has been taken from ethical committee. Ec No- KIMSDU/IEC/01/2021

3. Results

Total 96 patients with acute ischemic stroke were included in this prospective observational study, of which [68 (70.8%)] were males and [28 (29.2%)] were females. This study was predominated by the male gender with a male to female ratio of 2.42:1. A majority of the patients belonged to the age group of 61 to 80 years (43.75%), followed by 41 to 60 years (35.42%). The minimum age of the patients was 22years, and the maximum age was 62 years.

Figure 1: Distribution of Risk Factors of subjects with acute ischemic stroke



Majority of [41 (42.71%)] patients had hypertension as a comorbidity. Hypertension was found to be the commonest comorbidity followed

by smoking. Total [41 (42.71%)] patients had hypertension, of which [27 (65.85%)] were males, and [14 (34.14%)] were females.

Table 1: Electrocardiogram (ECG) findings in subjects with acute ischemic stroke

ECG	(n=96)	Percent
'T' wave Inversion	29	30.2
ST-segment Depression	37	38.5

'U' wave	51	53.1
Sinus Tachycardia	36	37.5
'Qtc' prolongation	12	12.5
Sinus Bradycardia	1	1.04

Total 96 patients, [29 (30.2%)] patients of acute ischemic stroke had 'T' wave inversion in Electrocardiogram (ECG), whereas [37 (38.5%)] patients of acute ischemic stroke had ST-segment depression. A total [51 (53.1%)] patients of acute ischemic stroke had 'U' waves in

Electrocardiogram (ECG). Out of 96 patients of acute ischemic stroke, [36 (37.5%)] had sinus tachycardia in Electrocardiogram (ECG) and [1 (1.04%)] patients had sinus bradycardia.

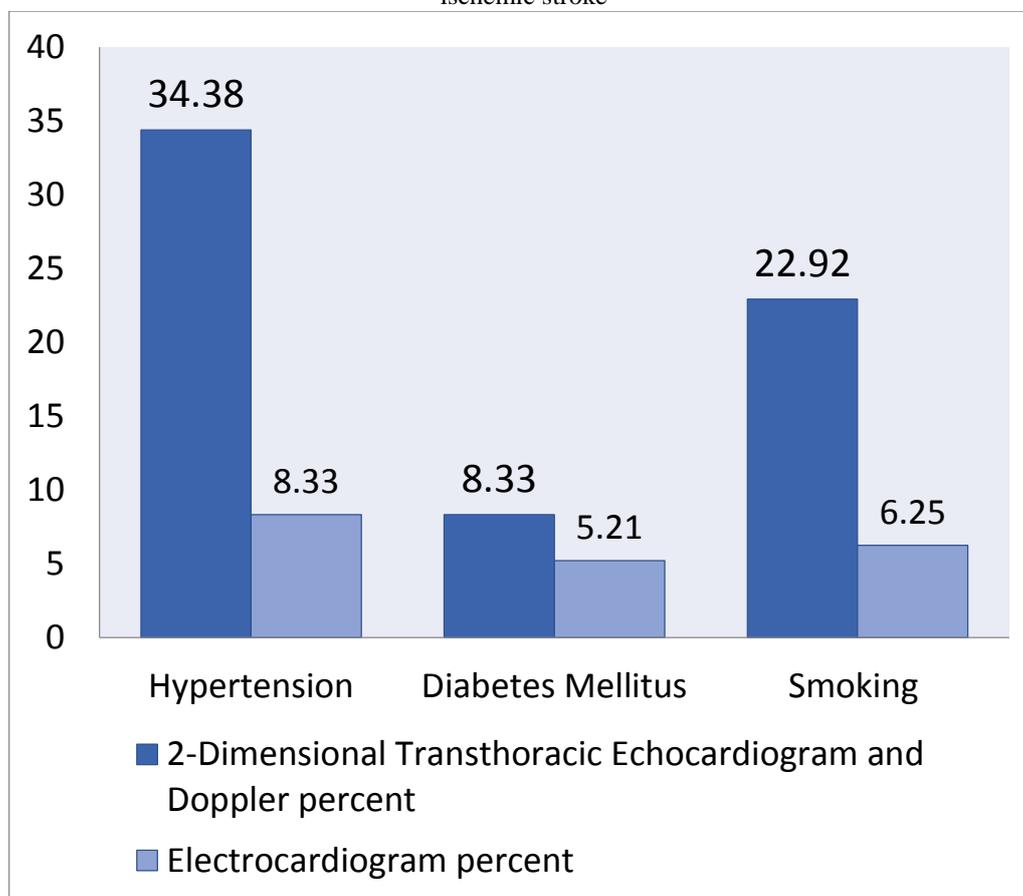
Table 2: Two Dimensional Transthoracic Echocardiogram and Doppler findings in subjects with acute ischemic stroke

2-Dimensional Transthoracic Echocardiogram and Doppler findings	(n=96)	Percent
Normal	43	44.8
Left Ventricular Dysfunction	33	34.3
Mitral Valve Abnormality	14	14.5
Aortic Valve Abnormality	6	6.2

Out of 96 patients enrolled in this study, a majority of 43 (44.8%) patients had normal 2decho findings. Total [33 (34.3%)] patients of acute ischemic stroke had Left ventricular dysfunction. Total [14 (14.5%)] patients had Mitral valve

abnormality. Total [6 (6.2%)] had Aortic valve abnormality. Left Ventricular Dysfunction was the most frequent abnormality noted on 2-Dimensional Transthoracic Echocardiogram and Doppler Study.

Figure 2: Risk factor profile and presence of Electrocardiogram (ECG) and 2-Dimensional Transthoracic echocardiogram and Doppler study (2D Echo and Doppler) abnormalities in study population with acute ischemic stroke



63 cases had 2- Dimensional Transthoracic echocardiogram and Doppler study (2D Echo and Doppler) findings in which most common associated risk factor was hypertension (34.38%) followed by smoking (22.92%). Similarly, 19 cases had Electrocardiogram (ECG) findings in which most common associated risk factor was also Hypertension (8.33%) followed by smoking (6.25%)

4. Discussion

Total 96 patients with acute ischemic stroke were included in this prospective observational study, of which [68 (70.8%)] were males and [28 (29.2%)] were females. This study was predominated by the male gender with a male to female ratio of 2.42:1. A majority of the patients belonged to the age group of 61 to 80 years (43.75%), followed by 41 to 60 years (35.42%). The minimum age of the patients was 22 years, and the maximum age was 62 years. Study by Carlo et al [6] had age more than 51 years in 41% and 71.8% each. [7] Tiago Tribolet de Abreu et al showed mean age was (73.6+8.7) years

and 52.6% were male. [8] Niveditha R et al showed that (58.4+13.7) years. [9]

Figure 1 shows that majority of [41 (42.71%)] patients had hypertension as a comorbidity. Hypertension was found to be the commonest comorbidity followed by smoking. Total [41 (42.71%)] patients had hypertension, of which [27 (65.85%)] were males, and [14 (34.14%)] were females. In Study by Carlo et al 48% were Hypertensive, 21% were Diabetes mellitus and 12.5% had past history of stroke. [6] And in study by Smith et al 87% were Hypertensive, 50% were Diabetes mellitus, 35.2% were smokers and 39.3% had past history of stroke. [10] Tiago Tribolet de Abreu et al showed 65.1% had Hypertension, 22.5% were Diabetes mellitus and 4.1% were smoker. [8] Niveditha R et al showed that 45% had Hypertension, 13% were Diabetes mellitus and 28% were smoker. [9]

Table 1 shows that of total 96 patients, [29 (30.2%)] patients of acute ischemic stroke had 'T' wave inversion in Electrocardiogram (ECG), whereas [37 (38.5%)] patients of acute ischemic stroke had ST-segment depression. A total [51 (53.1%)] patients of acute ischemic stroke had 'U'

waves in Electrocardiogram (ECG). Out of 96 patients of acute ischemic stroke, [36 (37.5%)] had sinus tachycardia in Electrocardiogram (ECG) and [1 (1.04%)] patients had sinus bradycardia. Niveditha R et al showed that 53.1% had ST-segment depression, 56.2% had 'U' waves and mean 'QTc' was (0.5+0.7ms) and 29.4% had 'T' wave Inversion. [9] Study by Tomar et al showed that 63.23% had 'QTc' prolongation, 69.1% had 'T' wave inversion, 96.91% had ST-segment depression and 48.5% had 'U' wave. [11]

Table 2 shows that out of 96 patients enrolled in this study, a majority of 43 (44.8%) patients had normal 2decho findings. Total [33 (34.3%)] patients of acute ischemic stroke had Left ventricular dysfunction. Total [14 (14.5%)] patients had Mitral valve abnormality. Total [6 (6.2%)] had Aortic valve abnormality. Left Ventricular Dysfunction was the most frequent abnormality noted on 2-Dimensional Transthoracic Echocardiogram and Doppler Study. Niveditha R et al showed that 29.4% had Left Ventricular Dysfunction. [9] Study by Tomar et al showed that 76.4% had Left Ventricular Dysfunction, 79.4% had mitral and 95.5% had aortic valve abnormality. [11] Uma N et al showed that 19.1% had Mitral valve abnormality and 20% had aortic valve abnormality. [12]

Figure 2 shows 63 cases had 2- Dimensional Transthoracic echocardiogram and Doppler study (2D Echo and Doppler) findings in which most common associated risk factor was hypertension (34.38%) followed by smoking (22.92%). Similarly, 19 cases had Electrocardiogram (ECG) findings in which most common associated risk factor was also Hypertension (8.33%) followed by smoking (6.25%). Study by Tomar et al showed that on Electrocardiogram (71%) had abnormal findings and on 2-Dimensional Transthoracic Echocardiogram and Doppler Study (54%) had abnormal findings, Among stroke survivors (56.41%) (44 out of 78) had normal 2-Dimensional Transthoracic Echocardiogram and Doppler findings while 43.59% (34 out of 78) had abnormal 2-Dimensional Transthoracic Echocardiogram and Doppler Study, while among patient who died due to stroke, 90.91% (20 out of 22) had abnormal 2-Dimensional Transthoracic Echocardiogram and Doppler Study finding, and only 9.09% (2 out of 22) patients had normal echo findings, which was statistically significant ($p < 0.001$). [11]

5. Conclusion

In present study ST-segment depression and 'T' wave abnormalities were frequent Electrocardiogram abnormalities and as Left

Ventricular Dysfunction (LVD) was frequent Echocardiogram abnormalities. This gives clue for risk factors of Atherosclerotic cardiovascular disease (ASCVD) like Hypertension, Diabetes Mellitus for risk stratification strategy. Common risk factor profile for Acute Ischemic Stroke (AIS) and Coronary Artery Disease (CAD) are also easily evaluated by Electrocardiogram and Echocardiogram. We suggest to evaluate all patients with Acute Ischemic Stroke (AIS) with Electrocardiogram and 2D Echocardiogram for better risk assessment.

6. References

- Anthony Etyang, and Charles R. Newton. Accuracy of clinical stroke scores for distinguishing stroke subtypes in resource poor settings: A systematic review of diagnostic test accuracy. *J Neurosci Rural Pract.* 2014 Oct-Dec; 5(4): 330–339.
- Chandrababu Devarapu, Lokesh S. A prospective study of electrocardiographic and echocardiographic changes in patients with cerebrovascular accidents. *International Journal of Advances in Medicine*, 2018, 5.4: 891.
- Elliott J, Smith M. The acute management of intracerebral hemorrhage: A clinical review. *Anesth Analg.* 2010;110:1419–27.
- Boon NA, Colledge NR, Walker BR, Hunter JA, editors. *Davidson's Principles and Practice of Medicine*. 20th ed. Philadelphia: Elsevier; 2006. p. 1200.
- Sandercock P, Molyneux A, Warlow C. Value of computed tomography in patients with stroke: Oxfordshire Community Stroke Project. *Br Med J (Clin Res Ed)* 1985;290:193–7. 2
- Carlo AD et al. Sex difference in the clinical presentation, resource use and 3 month outcome of acute stroke in Europe. *Stroke.* 2003; 34: 1114-1119.
- Venkataraman S et al. Cerebrovascular accidents – Clinical and radiological features. *JAPI* 1977; 25(8): 523.
- Tiago Tribolet de Abreu, Sónia Mateus and José Correia. Therapy Implications of Transthoracic Echocardiography in Acute Ischemic Stroke Patients. *Stroke.* 2005;36:1565–1566
- Niveditha R, Sai Lakshmi V.S., Rageswari T, Lakshmi Manasa S. Spectrum of electrocardiographic and echocardiographic changes in acute stroke -Our experience. *IAIM*, 2017; 4(1)
- Smith. *Neurology*, Volume 65(6); September 27. 2005: 855-858.
- A. P. S. Tomar, Satish K. Ramteke, Ravita Singh, Sharmila Ramteke. "Study of ECG and

echocardiographic Abnormalities in Stroke Patients and its Prognostic Significance". *Journal of Evolution of Medical and Dental Sciences* 2014; Vol. 3, Issue 11, March 17; Page: 2693-2698

Nanmaran, R., Srimathi, S., Yamuna, G., Thanigaivel, S., Vickram, A. S., Priya, A. K., ... & Muhibbullah, M. (2022). Investigating the role of image fusion in brain tumor classification models based on machine learning algorithm for personalized medicine. *Computational and Mathematical Methods in Medicine*, 2022.

Uma N, Chugh S, Goel A, Gopal D. Echocardiography in patients with cerebral infarction. *The Journal of the Association of Physicians of India*, 1999; 47(3): 291-3