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ORIGINAL ARTICLE

Adverse Association within Epilepsy and Cardiovascular Events

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ABSTRACT

Objective: To determine the association of epilepsy and cardiovascular event.
Study Design: Case control retrospective study
Place and Duration of Study: Department of Neurology, Isra University, Hyderabad from 1st September 2022 to 31st August 2023.
Methodology: Seven hundred cases were enrolled wherein 350 epileptic patients and 350 control cases. The study focused on epileptic patients within the age >18 years who were identified from hospital records. Those patients who suffered from epilepsy were placed in group 1 while those having no epilepsy and considered as controls were placed in group 2. The complete information in context to the medication code carbamazepine, valproate, lamotrigine used, was also recorded and compared within group 1 cases.
Results: Hypertension appeared to be the leading factor followed by poor nutrition and diabetes mellitus. All the cardiovascular outcomes including ischemic stroke, heart failure MI were also significantly higher in number as compared to control group.
Conclusion: Incidence rate and prevalence of cardiovascular events were significantly higher in hospitalized patients of epilepsy.
Keywords: Cardiovascular events, Seizures, Epilepsy, Mortality

INTRODUCTION

Cardiovascular events within epilepsy refer to occurrences such as strokes, heart attacks (myocardial infarctions), or other cardiovascular incidents that happen in individuals with epilepsy. While epilepsy primarily affects the brain and is characterized by recurrent seizures, there is evidence to suggest that there may be an increased risk of certain cardiovascular events in people with epilepsy compared to the general population. Seizures can lead to physiological changes such as increased heart rate, blood pressure fluctuations, and alterations in autonomic function. Prolonged or severe seizures may cause significant stress on the cardiovascular system, potentially increasing the risk of cardiovascular events.[1-4]

Epilepsy is a common neurological condition with increased incidence of mortality and morbidities. Only a small number of deaths in epilepsy are caused directly by seizures while majority of the deaths are related with secondary to epilepsy related causes including stroke, brain dysfunction, myocardial infarction, sudden cardiac death and neoplasm. Studies have showed that almost one quarter of deaths in epilepsy patients are occurred due to adverse cardiovascular events.[5] The association between epilepsy and cardiovascular events has been a topic of interest in medical research. While epilepsy primarily affects the brain, there is evidence suggesting a potential link between epilepsy and cardiovascular events.[6,7]

Epilepsy and cardiovascular disease share common risk factors such as hypertension, diabetes, obesity, and smoking. Individuals with epilepsy may have a higher prevalence of these risk factors, which can increase their susceptibility to cardiovascular events. Lifestyle behaviors play a significant role in both epilepsy and cardiovascular diseases. Seizures and the management of epilepsy can sometimes affect an individual's lifestyle, leading to decreased physical activity, irregular sleep patterns, and stress. These lifestyle factors can contribute to the development or exacerbation of cardiovascular risk factors, thereby increasing the likelihood of cardiovascular events.[8-10] Present study is purpose to determine the association of epilepsy and cardiovascular event.

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MATERIALS AND METHODS

This case control retrospective study was conducted at Department of Neurology, Isra University, Hyderabad from 1stSeptember 2022 to 31st August 2023.The study focused on epileptic patients within the age >18 years who were identified from hospital records. For a comparative analysis of the study a control group was also enrolled in the research within the same period of record. A telephonic informed consent was taken from each enrolled patient/participant or their deceased. A total number of 700 patients were enrolled wherein 350epileptic patients compared with 350 control cases were considered as sample size. The sample size was generated by using 95% confidence of interval, 80% power of test and 5% margin of error. The study was ethically approved before its beginning. The information in respect to demography, clinical history, clinical symptoms, comorbidities, and hospitalization history with related events were recorded in a well-structured questionnaire. Those patients who suffered from epilepsy were placed in group 1 while those having no epilepsy and considered as controls were placed in group 2. The complete information in context to the medication code carbamazepine, valproate, lamotrigine used, was also recorded and compared within group 1 cases. Those patients who were having cardiovascular diseases before the formation of epilepsy were excluded from the study. A 1:1 propensity-score matched (PSM) in accordance to the gender and age as well as other variables including epilepsy classification was applied within the groups. The primary outcome was considered as a composite of adverse cardiovascular events within 10-year time. Patients/Participants having critical comorbidities as diabetes, psychotic issues, autoimmune infections were excluded from the study. The record of previous myocardial infarction, ischemic attack, hospitalization for heart failure, new atrial fibrillation (AF), AF diagnosis, stroke and sustained ventricular tachycardia or fibrillation (VT/VF) was also recorded. The outcomes were compared for interpretation of the results. Data was analyzed using SPSS version 26.0 though tools of chi square and student t test. The p value <0.05 was considered as significant.

RESULTS

The mean age of the participants was 45.5±21.2years and cardiovascular risk factors were more common among group 2. Hypertension appeared to be the leading factor followed by poor

nutrition and diabetes mellitus (Table 1). All the cardiovascular outcomes including ischemic stroke, heart failure MI were also significantly higher in number as compared to control group (Fig 1). The prevalence of cardiovascular disorders was also significantly higher in epilepsy group than to control group (Fig 2). Prevalence of cardiac arrest, heart failure, incident myocardial infarction and ischemic stroke were also higher in group 2 according to confidence of interval (Table 2).

Table 1: Comparison of demographic information of the cases in both groups (n=700)

Characteristic	Group 1 (n=350)	Group 2 (n=350)	P value
Age (years)	45.5±21.2	51.5±20.6	1.00
Gender			
Male	182 (52%)	175 (50%)	1.00
Female	168 (48%)	175 (50%)	
Cardiovascular risk factors and lifestyle behaviours			
Hypertension	103 (29.4%)	84	<0.001
Diabetes mellitus	44 (12.5%)	53	
Chronic kidney disease	35 (10%)	38	
Smoker	41 (11.7%)	39	
Dyslipidaemia	36 (10.3%)	46	
Obesity	35 (10%)	36	
Alcohol-related diagnoses	23 (6.55%)	29	
Poor nutrition	33 (	25	

Table 2: Baseline medical diagnoses observed in study groups

Variable	Group I		Group 2		P value
	Event	Incidence %/year (95% CI)	Event	Incidence %/year (95% CI)	
All-cause death	62%	11.33 11.27–11.38)	29%	4.22 (4.17–4.26)	<0.0001
Heart failure	75%	4.76 (4.72–4.79)	6%	3.78 (3.74–3.81)	<0.0001
Incident MI	29%	0.67 (0.66–0.68)	24%	0.78 (0.77–0.80)	<0.0001
Ischemic stroke	15%	1.93 (1.89–1.94)	5%	0.92 0.91–0.95)	<0.0001
Incident AF	12%	2.34 (2.31–2.35)	6%	3.11 (3.05–3.15)	<0.0001
VT/VF	15%	0.19 (0.21–0.17)	20%	0.18 (0.17–0.19)	<0.0001
Cardiac arrest	2%	2.12 (2.04–2.21)	1%	0.33 (0.31–0.34)	<0.0001

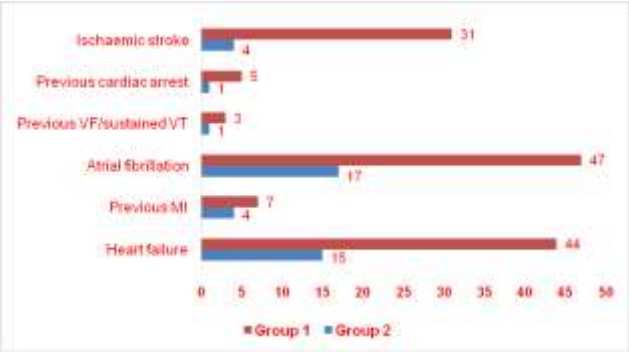

Fig 1: Cardiovascular outcomes in study groups

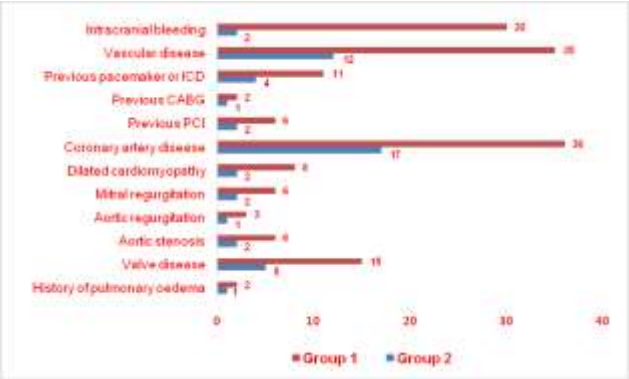

Fig 2: Comparison of cardiovascular related disorder between both groups

DISCUSSION

Epilepsy and cardiovascular events can indeed be associated, although the relationship is complex and multifactorial. Epilepsy and cardiovascular diseases share common risk factors such as hypertension, diabetes, obesity, and hyperlipidemia. Individuals with epilepsy may have a higher prevalence of these risk factors due to the underlying neurological condition or as side effects of medication. Epilepsy can sometimes be associated with autonomic dysfunction, which can affect cardiovascular function. This dysfunction may manifest as abnormal heart rate variability, blood pressure fluctuations, or other cardiovascular abnormalities.[11-13]

In this case control retrospective study, we observed that diagnosis of new epilepsy case was generally associated in patients having higher prevalence of cardiovascular risk factors including dyslipidaemia, diabetes, hypertension, smoking, alcohol use, imbalanced diet, heart failure, unhealthy life-style behaviors, cardiac arrest, ischaemic stroke and heart failure.[14-17] Cross-sectional analysis of various other studies has also reported the similar incidence rate of adverse cardiovascular events in epilepsy patients. Risk of cardiovascular diseases was elevated many times in stroke patients and among those patients who had vascular risk factors.[12,15,16]

Socio-economic factors and unhealthy life-style behaviors presented as important contributors to cardiovascular diseases in patients with epilepsy.[18,19] In the present study, epilepsy patients had significantly higher levels of obesity, smoking, alcohol related disorders and poor diet. Study conducted by Terman et al[20] identified that cardiovascular risk was attenuated in patients with epilepsy after adjusting and modifications in certain lifestyle behaviors. Differing patterns and adverse cardiovascular events was more associated in patients who developed epilepsy in younger age as compared to late onset.[21]

CONCLUSION

Incidence rate of cardiovascular events were significantly higher in hospitalized patients of epilepsy. Improving cardiovascular health can considerably improve in mitigating the chances of cardiovascular mortality and morbidity in patients with epilepsy.

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