PATTERN OF ARRHYTHMIA AMONG ISCHEMIC STROKE PATIENTS ON 24-HOUR AMBULATORY ELECTROCARDIOGRAPHY (HOLTER ECG) IN SOUTH-SOUTH NIGERIA

Abstract

Background: The 24-hour Holter electrocardiogram is avaluable tool for the identification of ischaemic alterations, cardiac arrhythmias in hypertension, stroke and other cardiovascular conditions. Electrocardiographic (ECG) abnormalities and cardiac arrhythmias have been detected in 50% of stroke patients. However, literature in this area of research is limited in our environment. This study is aimed at describing the pattern of arrhythmia observed in patients with ischaemic stroke using 24-hour Holter ECG in our locality.

Methods:A total of 22 stroke subjects whose age ranged from 41 and 83years were evaluated in GoodHeart Medical Consultants hospital for 24-hour ambulatory ECG (Holter ECG) from January 2015 – December 2016. The Holter ECG data was acquiredusing Schiller type (MT-101) Holter ECG machine.

Results: The study population consisted of 59.1% females and 40.9% males, with an average age of 66.95±12.32 years. Arrhythmias were more prevalent among females compared to males. However, bradycardia was more prevalent in males. Ventricular ectopics were the most common type of arrhythmia across both genders, with a higher prevalence in the older adult age group of 61-80 years.

Conclusion: The most common arrhythmia observed among the stroke subjects in Southern Nigeria is ventricular ectopics. This could be due to increase in age and severe neurological deficit which are independent predictors of arrhythmia onset and this was notably seen among the older subjects in the study. Extended cardiac monitoring such as Holter ECG is a well-accepted method for the identification of ECG abnormalities and the implementation of prompt treatment to reduce mortality.

Keywords:24-hour ambulatory Holter electrocardiography, Stroke, ischaemic, haemorrhage, Cardiac arrhythmias, Southern Nigeria

INTRODUCTION:

According to World Health Organisation (WHO), stroke is defined as an acute cerebrovascular neurological impairment that lasts longer than twenty-four hours or is terminated by death within twenty-four hours.(1) It is a common neurological disorder. Stroke caused 6.7 million of the 14.1 million deaths worldwide in 2012 due to cardiovascular diseases (CVD). Acute stroke victims frequently have underlying cardiovascular diseases (CVD), such as hypertension, atrial fibrillation, and ischemic heart disease.(2) Several pre-existing electrocardiographic (ECG)

anomalies, including left ventricular hypertrophy (LVH) with or without ST-T alterations, rhythm and conduction abnormalities, and other abnormalities, are linked to these underlying CVD.(2)

However, several researchers have proposed the existence of "brain-heart" axis, in which electrocardiographic abnormalities are the exclusive outcomes of structural brain disorders. (3)The exact mechanism underlying the development of these ECG changes remains uncertain, although growing evidence indicates it is primarily associated with autonomic nervous system dysfunction.(2,3)While some authors attribute underlying cardiovascular disease (CVD) to these ECG changes in acute stroke, others have shown that similar changes can also occur in acute stroke patients who do not have underlying CVD. (4)There are two types of stroke: ischemic stroke and hemorrhagic stroke.A blockage in a blood artery providing blood to the brain causes an ischemic stroke; while rupture or leakage to a blood vessel in the brain results in a hemorrhagic stroke.(1)

The 24-hour Holter electrocardiogram (Holter ECG), also known as Ambulatory Electrocardiographic Recordings (AECG) has been shown to be valuable in identifying ischaemic alterations, cardiac arrhythmias in patients with hypertension and diabetes.(5)It is recommended when there are suspicions of cardiac arrhythmias and a normal ECG is unsatisfactory.(6)Arrhythmias that are newly diagnosed often occur following a stroke and they occur as a result of abnormalities in the electrical conduction of the heart, though it remains uncertain whether they should be categorized as cardiogenic or neurogenic events.(7)Based on present evidence, electrocardiographic abnormalities and cardiac arrhythmias have been detected in 50% of patients experiencing an acute stroke.(8)

Specifically, a wide range of central nervous system (CNS) disorders, including brain tumours, subarachnoid haemorrhage (SAH), cerebral ischemia and haemorrhage, seizures, and head trauma, can cause different cardiac arrhythmias.(9) 15% to 30% of patients are likely to have new-onset ECG abnormalities that are related to an acute stroke. However, these alterations could be coincidental, as the risk factors for both stroke and coronary artery disease share similarities.(9) Despite the similarities in risk factors for coronary artery disease and stroke, these elevations in risk may still be coincidental.The reasons for the increased occurrence of cardiac arrhythmias in stroke patients include increased catecholamine levels, imbalances in cardiac autonomic function, and underlying or undetected cardiac issues not directly linked to the stroke.(8)

There have been reports of almost every electrocardiographic (ECG) abnormality in central neurologic lesions. These include cardiac arrhythmias (CA), such as ventricular ectopic beats (VEB) or supraventricular ectopic beats (SVEB); ventricular arrhythmias (VA), especially ventricular tachycardia (VT); atrial flutter/fibrillation (AF); and repolarization abnormalities (QT interval prolongation, ST segment changes, large upright or inverted T-waves, and septal U waves).(9)Cardiac arrhythmias, commonly occurring as a complication in the acute stage of cerebral ischemia, are linked to increased levels of morbidity and mortality.(10,11)Their occurrence is linked not solely to a heart disease history but also to various factors, including autonomic dysfunction resulting from interactions between the heart and the brain.(10,12)

Abnormalities in 24-hour ECG recording is necessary for prognosticating and management of patients with ischaemic stroke especially those of cardiogenic origin. Literature in this area of research is limited in our environment hence, this study is aimed at describing the pattern of arrhythmia observed in patients with ischaemic strokeusing 24-hour Holter ECG in our locality.

MATERIALS AND METHODS:

A retrospective-descriptive study was performed in GoodHeart Medical Consultants, a private medical facility in South-South, Nigeria from January 2015 to December 2016. The Holter ECG data of 22 patients managed for ischaemic stroke were studied. Their age ranged from 41 years above.The data used in the study were gathered as per standard protocols. A Schiller Microvit MT-101 Holter machine was affixed to the subject to readings over a 24-hour span, after which the data was retrieved. Holter monitoring typically captured ECG activity continuously throughout the course of a day. A diary was issued to subjects to document any symptom observed.

The device produced a summary page containing reports. Details such as the subject's name, address, and any indication for the test, usually found on the summary sheet, were recorded.The data were entered into Microsoft Excel, and STATA version 15 were used for statistical analysis. The information was presented using descriptive statistics, which included tables. Proportions and percentages were used to represent categorical variables, while mean ± standard deviations were used to represent continuous variables.

RESULTS

22subjects with ischaemic stroke were observed; 9 (40.9%) males and 13 (59.1%) females. The most common age group were elderly individuals (61-80 years) with 12 (54.55%) while age groups, 41-60 and >80 were the least common age groups being 5 (22.73%) each.

The most common type of arrhythmia for Holter ECGs was ventricular ectopics15(68.2%). Supraventricular ectopics was seen in 11 (50%) and tachycardia in 10 (45.5%) of the stroke subjects. Bradycardia was seen in seven (31.8%) of the stroke patients. None of the stroke patients had ventricular tachycardia nor ventricular fibrillation. Ventricular ectopics and supraventricular ectopics were more prevalent in females than males. There was no significant relationship between gender of stroke subjects and arrhythmia (p-value >0.05). Table 2 shows the occurrence of arrhythmia in the different genders of stroke subjects.

Figure 1 shows the prevalence of arrhythmia according to the different age groups. Majority (58.3%) of the subjects in 61-80 age group had ventricular ectopics and tachycardia, followed by supraventricular ectopics (50%) and bradycardia (25%). Majority (60%) of the subjects in 41-60 age group had ventricular ectopics, followed by those with supraventricular ectopics, tachycardia, bradycardia (40%).

Table 1: Demographic characteristics of the study population

Variables	Frequency (%)	Mean ± Standard deviation
Gender		66.95 ±12.32
Male	9 (40.91)	66±13.93
Female	13 (59.10)	67.54±11.78
Age group		
41-60	5 (22.73)	48.8± 6.461
61-80	12 (54.55)	69.58 ± 4.87
>80	5 (22.73)	81.75 ± 0.5

Table 2: Prevalence of the arrhythmia among the stroke subjects

Arrhythmia	Male (n=9)	Female (n=13)	Total (n=22)	Pvalue
Tachycardia	3 (33.3%)	7 (53.8%)	10 (45.5%)	0.338
Bradycardia	5 (55.6%)	2 (15.4%)	7 (31.8%)	0.13
Ventricular Ectopics	6 (66.7%)	9 (69.2%)	15 (68.2%)	0.783
Supraventricular Ectopics	5 (55.6%)	6 (46.2%)	11 (50%)	0.578
Ventricular Tachycardia	0	0	0	0
Ventricular Fibrillation	0	0	0	0

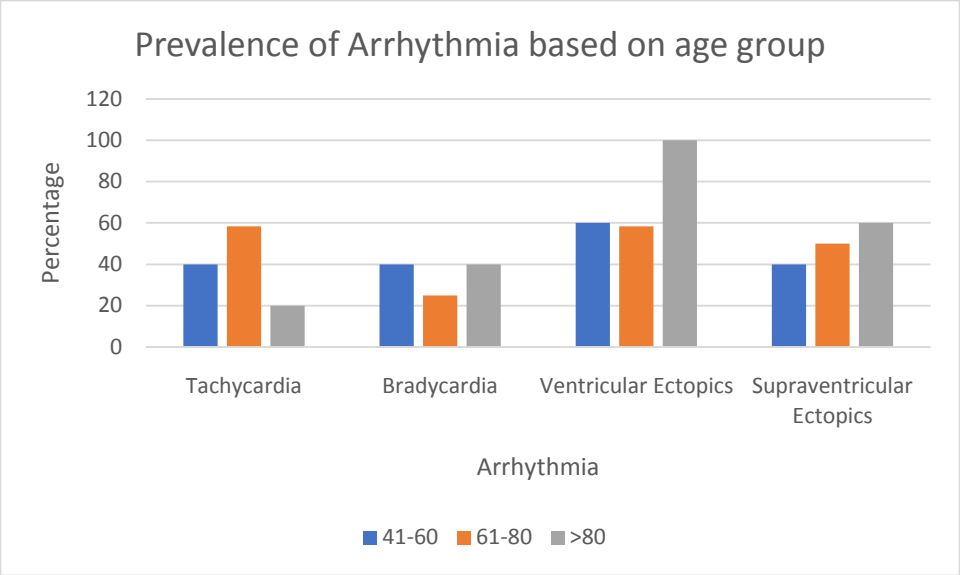

Figure 1: Prevalence of Arrhythmia according to the age group of study population.

DISCUSSION

Previous studies done in our environment showed the existence of ECG abnormalities observed in ischemic stroke patients.(2,13) However, there has not been any study demonstrating the relevance and benefits of Holter ECG in stroke in our environment.This study showed a general mean age of 66.95 ± 12.32 years while the most prevalent age group was 61-80 years (n=12; 54.55%) with mean of 69.58 ± 4.87 years. The mean age finding is similar to those reported in previous studies.(10,14) It was observed in this study that occurrence of arrhythmia is more frequent in older patients, age group 61-80. (15–17) This could be due to the fact that majority of the stroke subjects were in these groups and they comprise a greater percentage of the study population. Stroke patients of advanced age are at a higher risk for clinically significant arrhythmias.(10)Age maybe regarded as a risk factor associated with the occurrence of cardiac arrhythmias due to the increased prevalence of heart disease and cardiovascular risk factors among older individuals.(18,19)Also, a previous study reported that age is the primary non-modifiable risk factor for stroke and older individuals generally experience poor functional results afterwards.(20,21)

Cardiac arrhythmias particularly atrial fibrillation has been noted to be acause of stroke from SIRENand other studies (2,10,17),but our study recorded more of ventricular arrhythmias. This could be due to the use of regular 12-lead ECGs in the other studies compared to the Holter ECG used in our study. However, supraventricular arrhythmia (atrial fibrillation and supraventricular tachycardia) closely followed the ventricular arrhythmias.

A higher occurrence of arrhythmia was observed in female than in male stroke subjects and this is similar to a previous study.(22) The study stated that although the exact causes of these gender disparity are unknown, the impact of hormone and differences in QT intervals between the genders could be responsible. (22)Cardiac arrhythmiascommonly occur as complications during the acute phase of cerebrovascular events, whether ischemic or hemorrhagic, and could result in sudden death.(10)Post stroke, autonomic cardiovascular dysfunction is common, providing an explanation for why brain lesions might be considered a contributing factor to cardiac arrhythmias.(11,23)

Ventricular Ectopics and Supraventricular ectopics were the most common arrhythmia, accounting for 68.2% and 50% of the sample population respectively, while bradycardia accounted for 31.8% in our study.This is similar to another study done in Toronto.(24)It was also found that tachycardia was more common than bradycardia among our subjects (45.5% vs 31.8%) which is consistent with a similar study in stroke patients.(10)

The incidence of arrhythmia in this study was 100%. All the stroke subjects presented with at least one type of arrhythmia. It was noted in another study thatindividuals with stroke who were admitted to the hospital had a greater incidence of arrhythmias of any kind than individuals who did not have a stroke. The figures and patterns differ between researches and are based on the two types of stroke: ischemic and hemorrhagic.(8)There appears to be a broad agreement that individuals who have had an ischemic stroke should be monitored closely for severe arrhythmia and sudden cardiac death for at least the first 24 hours following the incident.(15,25)

A study showed that arrhythmias were more common in strokepatients with established vascular risk factors, such as diabetes mellitus, arterial hypertension, and older age, as well as pre-existing cardiac comorbidities.(15)

CONCLUSION

The most common arrhythmia observed among the stroke subjects in South-South Nigeria is Ventricular ectopics closely followed by supraventricular ectopics. This could be due to increase in age and severe neurological deficit which are independent predictors of arrhythmia onset and this was notably seen among the older subjects in the study.Extended cardiac monitoring such as Holter ECG is a well-accepted method for the identification of ECG abnormalities and the implementation of prompt treatment to reduce mortality. Widespread use of this diagnostic tool for more concise patient management and prognostication is advocated.

STATEMENT OF ETHICAL APPROVAL

Ethical approval was obtained from the University of Port Harcourt Teaching Hospital ethical committee.

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