

## Descriptive evaluation of holter recordings at a teaching hospital in central Nigeria

Caleb M. Chundusu , Maxwel O. Akanbi , James A. Onuh, Ganiyu A. Amusa,  
Solomon S. Danbauchi, Basil N. Okeahialam

### Abstract

**Background:** Holter monitoring is a cardiovascular test available in few centres in Nigeria. It is indicated when cardiac rhythm disorders are suspected and standard electrocardiogram is not helpful. A simple overview of this test could give an idea of what cardiovascular complications are common.

We evaluated the indications and simple results of outcome of Holter monitoring in a teaching hospital.

**Methods:** This descriptive cross-sectional study evaluated the indications and findings of patients that had a 24 hour Holter recording at the Jos University Teaching Hospital over a four year period between January 2011 to December 2014, utilizing routinely collected hospital data.

**Results:** A total of 113 subject had Holter monitoring over the study period. The population had an age range 4-90 years, consisting of consisting of 60 (53%) male and 7 (6%) children. The main indications for Holter monitoring were palpitation (28%) and hypertensive heart disease (26%). Common findings

following evaluations were tachycardia 49.5% and bradycardia 17.9%. Wide QRS complex tachycardia was detected in 20.4%, ST segment depression in 47.8% and atrial fibrillation in 28.7%. Asystole was seen in 18% of subjects with a mean duration of 2.17secs, arrest was recorded in 26.7% of those with asystole. The longest duration was 7.58secs. Premature atrial ectopics were seen in 56.7%, premature ventricular ectopics in 44.6% and multiple ventricular ectopics in 32.9% of subjects.

**Conclusions:** Palpitation and hypertensive heart diseases were the two most common indications for Holter monitoring test. Tachycardia and premature atrial contractions were the most common rhythm abnormalities seen.

**Keywords:** Holter monitoring, ambulatory electrocardiographic recording, arrhythmia, Jos, Nigeria

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### Introduction

Holter Monitoring is a cardiovascular test available in very few centres in Nigeria. This is one of several types of Ambulatory electrocardiographic recordings (AECG). AECG is a continuous recording of the electrocardiography of a patient over 24-48 hours<sup>1</sup>. Cardiac events that are intermittent may not be captured by the standard static simple ECG tracing so a 24-48 hour tracing will be required to pick up these events. The test may also quantify any of these events detected<sup>1</sup>.

Generally AECG is used to assess symptoms related to disturbance of cardiac rhythm and assess risk in patients having cardiac conditions without symptoms of arrhythmia. The ACC/AHA guidelines on AECG<sup>1</sup> has outlined various indications for this test such as in assessment of symptoms that may or may not be related to disturbance of heart rhythm which<sup>2,3,4</sup>. This includes in assessment of risk in survivors of myocardial infarction survivors that are at an increased risk of

sudden death from ventricular fibrillation/tachycardia (VT/VF).<sup>5,6,7</sup>; Congestive cardiac failure patients are prone to having VT/VF and low heart rate variability (HRV)<sup>8</sup>; persons with hypertrophic cardiomyopathy<sup>4</sup> and persons with valvular heart disease.<sup>8</sup> Other indications include: Diabetic neuropathy (prone to low HRV, depressed ST-segment and ventricular arrhythmias)<sup>9,10</sup>, and systemic hypertension,<sup>1,4,11</sup> monitoring of anti-arrhythmic therapy (CAST)<sup>8</sup>, pacemaker and intra-cardiac device (ICD) functions monitoring, monitoring of myocardial and vascular ischemia<sup>5,6,7</sup>.

Holter monitoring was recently introduced to our facility. The main aim of the report is to determine the main indications for referral for Holter monitoring as well as described the rhythm abnormality among patients at the Jos University Teaching Hospital..

### Materials and Methods

#### *Study locations and subjects*

A descriptive cross-sectional study was performed at the Jos University teaching Hospital (JUTH), plateau state Nigeria. All consecutive patients were referred to the cardiology laboratory for Holter monitoring between 2011 and 2014 were eligible and consecutively enrolled. Ethical approval was obtained from the ethical committee.

Department of Medicine, Jos University Teaching Hospital, Jos Plateau State

All correspondence to;  
Caleb M. Chundusu Department of Medicine Jos University Teaching Hospital, Jos Plateau State  
Email; Calebchundusu@yahoo.com

### Measurements and data collection

The study utilized a routinely collected data. The *cardionetics C.Net5000, version1.0/P6G* machine was used for Holter monitoring. This machine was mounted on subject to records ECG for 24 hours after which the data is extracted. Generally, Holter monitoring records ECG over 24 hours. There is usually an additional switch for the subject put on whenever patient feels the symptom for symptom analysis. Ambulatory blood pressure should also be recorded simultaneously and patient is allowed to do their routine activities, routine medications may be allowed, adjusted or stopped depending on the indication for the AECG.

A summary page of the reports were produced by the device. Subjects name, address and notes/indication for the test usually indicated on the summary sheet were noted. The mean, maximum and minimum heart rates are recorded.

### Definitions

The device automatically generated the reports. Tachycardia events were recorded as pulse greater than 120 beats per minute (>120bpm) and bradycardia events pulse less than 50 beats per minute (<50bpm). Asystole indicating heart beat delays over 1.7seconds and arrest >3.0 sec are recorded. Ectopic beats were indicated as atrial ectopics, ventricular ectopics or multifocal ventricular ectopics. The reports of ectopics are given as total ectopics per hour.

### Data analysis

Data were analysed using epi-info. Continuous variables were summarized as means (standard deviation) if normally distributed or median (range) if skewed. Categorical variables were summarized as frequencies and percentages. Frequencies of cardiac events were reported as frequencies and percentages.

### Results

One hundred and thirteen (113) patients, 60 males 53 females had AECG. The mean age of the populations was 42±11 years with a range 4-90 years. Mean age of males and females were 43±19 years and 42±17 years respectively. There were seven 7 children (all boys) with age range 4-10 years and mean age of 7.6 years. The 106 adults had an age range of 19-90 years with sex ratio 1:1.

### Indications for AECG

A total of twenty (20) indications for the request for AECG were noted and the six most frequent indications were presented, palpitation 28%, hypertensive heart disease 27%, cardiomyopathy 15%, rheumatic valvular heart disease 11%, pericarditis 6%, congestive cardiac failure, 6% [Figure 1]. The remaining indications were grouped as others 7%, amongst the others included; syncope, cor-pulmonalae, sickle cell disease, ischemic heart disease, arrhythmia, ventricular tachycardia, HIV

cardiomyopathy, endomyocardial fibrosis, tetralogy of Fallot, ventricular septal defect and hypertrophic cardiomyopathy.

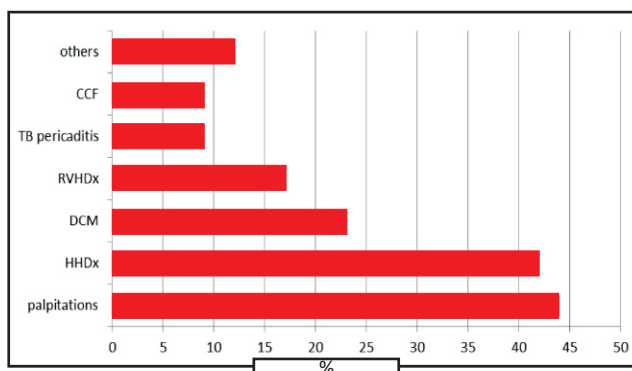


Figure 1. Frequencies of indications for AECG

HHD- hypertensive heart disease, DCM- dilated cardiomyopathy, RVHD- rheumatic valvular heart disease, TB- tuberculosis, CCF- congestive cardiac failure.

### Rate and rhythm abnormalities

Heart rate summary showed tachycardia events were recorded in 59% and 44% in females and males respectively. Bradycardia events recorded in 25% and 11% in males and females respectively.

Rhythmic abnormalities recordings showed wide complex tachycardia recorded in 20.4%, ST-segment depression in 47.8% and atrial fibrillation in 28.7%. Asystole was seen in 18% of subjects which had a mean duration of 2.17 secs, arrest was recorded in 26.7% of those with asystole. The longest duration of the asystole was 7.58 secs.

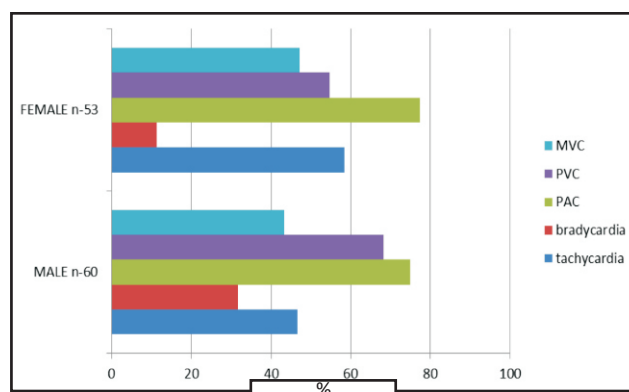


Figure 2. cardiac rate and rhythm abnormality based on gender

MVC- multiple ventricular contractions, PVC- premature ventricular contractions, PAC- premature atrial contractions

Premature atrial ectopics were seen in 56.7%, premature ventricular ectopics in 44.6% and multiple ventricular ectopics in 32.9% of subjects. Premature atrial contractions (PAC) was similar in both sexes, female 78% and male 76%. Premature ventricular contractions (PVC) recorded were relatively more common in males

68% than female 56% respectively. Multifocal ventricular contractions (MVC) were recorded in 44% and 48% male and female respectively [Figure 2]

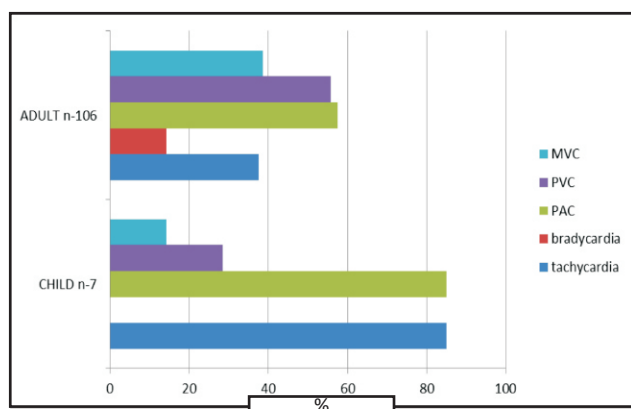


Figure 3. Cardiac rate and rhythm disorders based on age MVC-multiple ventricular contractions, PVC- premature ventricular contractions, PAC-premature atrial contractions

Tachycardia events and premature atrial contractions were recorded in 80% of children and none had bradycardia event [Figure 3]. Asystole (<1.7 sec) was seen in 15 (28%)males and 13 (24%)females in which an arrest (>3sec) was observed in 6.7% and 7.7% of male and females respectively.

### Discussions

Utilizing retrospective collected data during routine AECG monitoring we determined indications as well as pattern of rhythm and rate abnormalities among patients in Jos, Nigeria. The most frequent indications for referral for AECG in our study populations were palpitations and hypertensive heart disease.

Adebayo et al in Ile Ife<sup>13</sup> demonstrated that palpitation was the most common indication for the request for an AECG, a situation not different from that seen in this study. Palpitation as an indication was similarly observed to predominate as an indication in the ACC/AHA study.<sup>14</sup>

Concerning rate abnormalities tachycardia events or tachyarrhythmia was more frequent than bradycardia. Tachycardia can be physiological particularly in children since heart rate is relatively higher in children. Adults are more likely to have pathological causes of tachyarrhythmia, a term comprising many entities not differentiated in the study. Increased sympathetic hyperactivity is a component of heart failure that occurs early in an effort to maintain cardiac output. Bradycardia events are almost exclusively caused by intrinsic problems like heart blocks or depressed heart (cardiogenic shock). These intrinsic heart diseases are acquired most of the time and so rarely seen in children. We found a higher frequency of rate abnormalities in male, similar to that reported by previous studies while the cause of this has not been fully elucidated, suspected

factors include genetic make-up, hormonal balance and social factors.<sup>5,6,9,10</sup>

The relatively higher frequency of ST-segment depression occurrences seen may suggest ischemia heart disease may not be uncommon in our environment. ST-segment changes may however be due to other causes such as hyperventilation, hypertension, LV hypertrophy, LV dysfunction, conduction abnormalities, postural changes, drugs and electrolyte abnormalities.<sup>12</sup> we did not have adequate information to determine the cause to ST-segment changes in our study.

Premature atrial contractions (PAC) is a much more frequent finding in cardiovascular disorders, while multiple ectopics is much less common. Premature ventricular contractions (PVC) were more frequent in males. This is not surprising because the SA node which is in the atrium is more easily affected by factors that alter cardiac rhythms.

### Limitations

Our study had some limitations. First, indications for AECG referral in this study was made by the referring physicians who were not necessarily cardiologist and clinical reviews were not carried out before commencement of the test. Secondly, events in the study were recorded as present or absent and the absolute frequencies of event in subjects were variable and not included in the analysis. Lastly, analysis was based on summary sheet and the recordings of details of rhythm disorders were not considered.

### Conclusions

Palpitation and hypertensive heart diseases were observed to be the most common indications for this test. Tachycardia and PAC were the most frequent recordings in individuals with heart disorders. Bradycardia and PVC were seen to be relatively frequent in adult male probably suggesting poor prognosis of cardiac disease in male gender.

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