ECG changes in octogenarians

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ABSTRACT

Numerous studies have been done about the Electrocardiogram (ECG) in the elderly but just a few regarding the changes in ECG in octogenarians. Ageing is definitely associated with changes in the cardiac conduction and physiology. This study attempts to evaluate the ECG in octogenarians. ECG recordings from 165 octogenarian subjects were obtained from subjects aged 80-89 years, mean age was 82.75 ± 2.41 years. ECG's were normal in 27.27 % of the study population. The major abnormalities noted were right bundle branch block 15.15%, left ventricular hypertrophy in 13.93%, Poor R-wave progression in precordial leads in 10.91%, atrial fibrillation in 8.48%, ST changes in 8.48%, sinus tachycardia in 6.66% and sinus bradycardia in 4.84% of the study population. The mean QTc was 0.41s. Because of its non- invasive nature, ECG is a least expensive, readily available diagnostic tool for evaluating cardiac health issues in the growing elderly population. We hope the observations will be helpful in future studies, in evaluating cardiac health in octogenarians and in clinical practice.

Keywords: ECG, octogenarian, elderly.

INTRODUCTION

Life expectancy has increased significantly in the last two decades worldwide. Life expectancy at birth in Nepal is also on the rise. 4% of the population is estimated to be 65+ years in Nepal.[1] This rise of life expectancy at birth is a good indicator of the improving health status of the country in general, due to which the concerns about the health of the elderly in the population has risen significantly. Ageing with minimum health issues and disability is not easy especially as prevalence of certain diseases increase with age. Health expenditure is a big burden for most as Nepal does not have a universal healthcare coverage policy.

Cardiac function too is altered in the elderly due to the degenerative changes affecting the heart. The electrophysiology is altered in part due to degenerative changes that cause a decrease in the number of SA nodal cells with advancing age.[2] ECG abnormalities are frequent in the elderly; they increase with age and are associated with increased mortality.[3] Disorders like atrial fibrillation (AF) are said to increase as the population of the elderly is rising.[4] Study by *Camm et al*[5] estimate that around 8% of people over 80 years of age have AF.

This study attempts to evaluate the need for routine ECG as a screening tool in the octogenarian population in Nepal. In general the mortality is lower in old persons with ECG abnormalities than in younger persons,[6] it is imperative that they are recognised and taken care of before they progress to being life threatening.

MATERIALS AND METHODS

The study was conducted in octogenarians who presented in Nepal Medical College Teaching Hospital (NMCTH) from June 2003 to October 2011 for general medical consultation. ECG recordings were taken by a standard 12-lead ECG machine from 165 subjects and were evaluated. The mean age of the study population was 82.75 2.41 years. 64.24% were males (mean age 83.03 2.35 yrs.), 37.76% were females (mean age 82.47 2.53 yrs.).(Table-1) Participants below 80 and above 89 years were excluded.

The tracings were examined and interpreted by a single investigator in order to avoid inter-investigator bias. Also, accurate scaled Xerox copies were obtained and kept on record as most ECG markings/tracings tend to fade with time.

RESULTS

Twenty seven point twenty seven% of the study population had normal ECG, (23.74% females and 29.24% males). The mean heart rate was 83.67 bpm. (Mean in males 82.34±19.95 bpm, in females it was 86.1±28.06 bpm).

Most noted abnormalities were left ventricular hypertrophy (LVH) in 13.93% (Table-2). Right bundle branch block (RBBB) in15.15%where 13.93% was complete RBBB and 1.21% was incomplete RBBB (Table-3). Right ventricular hypertrophy (RVH) was noted in just 1.82%of the study population.ST-segment

Table-1: Characteristics of study population

Sex	No. of study Subjects (%)	Mean Age (SD)
Male	106 (64.2)	83.03 (±2.35)
Female	59 (35.7)	82.47 (±2.53)
Total	165 (100.0)	82.75 (±2.41)

changes were noted in 8.48% (n=14).

Iº AV block was seen in 8.48%. Left anterior hemiblock (LAHB) was seen in 7.27%. Atrial fibrillation (AF) was seen in 8.48 % (n=14) of subjects, where females had a slightly higher incidence (10.17%) as compared to males (7.58%) in the study. Premature ventricular beats were noted in 8.48%, premature supraventricular beats in 8.48 %with atrial premature contractions (APC) contributing 3.64%. Left bundle branch block (LBBB) was seen in 3.03%of subjects. Bifascicular block and Wolff-Parkinson-White Syndrome (WPW syndrome) was seen in just 1 subject each (0.61% each) (Table-3).

Poor R-wave progression (PRWP) in precordial leads was seen in 10.91%of the study population a third of which was clearly due to COPD. Sinus tachycardia was noted in 6.66% (n=11) and sinus bradycardia in 4.85% (n=8) of subjects. Left atrial overload (LAO) was seen in just 1 person (0.61%) (Table-2).

Abnormalities in the electrical axis were also notable findings. Left axis deviation (LAD, axis from -30º to -90º) was seen in 10.9%and right axis deviation (RAD, axis from 90º to 180º) was seen in 6.1% (Table-2).

Mean QTc (Bajett's correction method, normal 0.35-0.43 sec) duration was 0.41 sec which is nearly the upper limit of the normal range. 71.52 % (n=118) had normal QTc, 18.78 % (n=31) had prolonged and 9.7% (n=16) had shortened QTc.

Table-2: Morphological abnormalities

ECG Abnormalities	n. (%)
Normal ECG	45 (27.3)
Sinus bradycardia	8 (4.8)
Sinus tachycardia	11 (6.7)
Left atrial overload (LAO)	1 (0.6)
Left axis deviation (LAD)	18 (10.9)
Right axis deviation (RAD)	10 (6.1)
Left ventricular hypertrophy (LVH)	23 (13.9)
Right ventricular hypertrophy (RVH)	3 (1.8)
ST-segment changes	14 (8.5)
T-wave changes	15 (9.1)
Poor R-wave progression (PRWP)	18 (10.9)

The PR interval was normal in 84.24% (n=139) with just 1.82% (n=3) having prolonged, 2.42% (n=4) shortened PR interval and in 11.52% (n=19) the PR interval could not be determined mainly due to atrial fibrillation.

Overall, just 27.27% had normal ECG and the rest had one or more abnormalities. 34.55% had 1 abnormality on ECG, 23.03% had 2 abnormalities, and 10.30% had 3 abnormalities, 3.64% had 4 and 1.21% had more than 4 abnormalities on their ECGs (Table-4).

DISCUSSION

Studies on octogenarian ECG were not abundant, so comparisons were limited. However, there are many studies done on the elderly population and centenarians in different parts of the world.

Among the Cracow population aged 70-96 years 26.0% had normal ECG.[7] In two other studies 8% and 10.7 % octogenarians respectively had normal ECG[8,9] which is nearly half of our study finding (27.27%). Based on these studies we can definitely say that with ageing the chances of having a normal ECG decreases significantly (Table-4).

The most common abnormality noted in our study was the right bundle branch block (RBBB) which was seen in 15.15%. Complete RBBB was seen in 13.93%and incomplete RBBB was seen in 1.21% of the study population. It is surprising that similar findings were not noted in other studies. Could this simply be attributed to coronary artery disease (CAD), hypertension or conduction disorders that increase with age and are major causes of rhythm and rate disorders? One study noted that degenerative and ischemic changes in the conduction system results in a variety of arrhythmia, conduction disturbances and increased bundle branch blocks[6] (Table-3).

Significant ST changes were noted in 8.48% (n=14) of subjects. 4.24% (n=7) had ST elevation and 4.24% (n=7) had ST-segment depression. Nearly all of the ST-segment changes were due to CAD in our study. In a study done in Switzerland ST- segment depression was found in every fifth centenarian,[10] in another Danish study in every fourth subject[11] and in 34.5 % in a polish study.[12] T-wave changes, mostly due to ischemia were seen in 9.1% (n=15),however non-specific T-wave changes were seen in 22.42% (n=37) of the study population. Increased incidence of T-wave abnormalities with ageing has been confirmed by a prospective study that estimates 25.2% of more than 80 years old subjects have changes in T-wave morphology[7] (Table-2).

Table-3: Rhythm and conduction abnormalities

ECG Abnormalities	n. (%)
Iº AV Block	14 (8.5)
Complete RBBB	23 (13.9)
Incomplete RBBB	2 (1.2)
LBBB	5 (3.0)
Left Anterior Hemiblock (LAHB)	12 (7.3)
Bi-fascicular Block	1 (0.6)
Premature Supraventricular Beats	8+6 APC= 14 (8.5)
Premature Ventricular Beats	14 (8.5)
Atrial Fibrillation (AF)	14 (8.5)
Wolff-Parkinson-White Syndrome	1 (0.6)

Left ventricular hypertrophy (LVH) was seen in 13.93% of the study population. ECG with LVH are more common in younger geriatric subjects (10-12.5%)[9,13,14] than in centenarians (2.9%).[12] Right ventricular hypertrophy was seen in 1.82% of our study population.

Left axis deviation (LAD) was seen in 10.9% which is less compared to a study which found it present in 45.7% of centenarians.[12] Right axis deviation (RAD) was seen in 6.1% Table-2.

Atrial fibrillation (AF) was seen in 8.48% which is similar to a study by Camm *et al*[5] who estimate that 8% of people over 80 years have AF. Slowed conduction could be one of the strongest triggers of AF.[15] AF incidence will continue to increase as the elderly in the population also increase.[4]

Premature ventricular beats were seen in 8.48% of the study population. Studies have found supraventricular beats in 14.3% and ventricular beats in 5.7%[12] and *Cornu* reported supraventricular beats in 28% and ventricular beats in 8% of centenarians.[10]

Left anterior hemiblock (LAHB) was seen is 7.27%, bifascicular block in 0.61% (1 subject). In relatively young subjects this incidence is less frequent but increases with age; 7.4% in > 80 years old and 23.2% in > 90 year old.[8,16] Iº AV conduction block was seen in 8.48%. It is regarded as a typical finding in ECG of the elderly.[17,18,19]Molaschi *et al* found it in 8.5% of octogenarians,[16] which is similar to our finding.

QTc and PR-interval abnormalities were seen in only a small number of subjects. Mean QTc (Bajett's correction method) was 0.41secs; with 71.52 % having a normal QTc. 84.24 % had normal PR-interval (normal 0.12 to 0.2secs) which is quite contrary to the notion that PR-intervals progressively increase with ageing.[20]

Table-4: Number of ECG changes

Abnormalities	n. (%)
0	45 (27.3)
1	57 (34.6)
2	38 (23.0)
3	17 (10.3)
4	6 (3.6)

Though the observed patterns on ECG were variable individually, what was consistent was than about two-thirds of the study group had some form of abnormality on their ECG. Multiple abnormalities (> 2) were present in about one-third the study population, which is cautionary as they predict higher negative prognostic value[21,22] (Table-4).

The proportion of the elderly in the population is rising every year the worldwide and so will the diseases that cause disability and loss of wellbeing. We hope this study will renew the idea that ECG as an inexpensive and readily available diagnostic tool, can serve as a widely used method to diagnose and treat cardiac diseases in a timely manner. It could save a lot of lives, save money and contribute to the general good health in the last leg of our lives.

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