P WAVE ANANYSIS IN ASYMPTOMATIC HEALTHY ADULT NIGERIAN STUDENTS: A PRELIMINARY STUDY

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Summary: The P wave amplitude and duration were measured and analyzed in the 12-lead ECG in a hundred and nine subjects aged between 19 and 30 years. The mean P wave duration was 0.07 ± 0.02 sec. Significant correlation was found between P wave duration and amplitude and various anthropometric measurements. Prediction equation was derived for the mean P wave voltage and the systolic blood pressure. The study has demonstrated the normal range for the P wave duration and amplitude. It thus provides a reference guide for the quantitative interpretations of the P waves of healthy adult Nigerians in Jos.

Key Words: *Electrocardiogram (ECG), P wave duration, P. wave amplitude, prediction equation, asymptomatic.*

Introduction

Attempts have been made and comprehensive studies of the 12-lead electrocardiogram (ECG) ascertaining the normal range for P wave duration and amplitude in various Human races (Chen., *et al* 1989, Simonson, 1961; Ueda, *et al*, 1963).

However, there is a dearth of information regarding detailed studies of the quantitative measurements of the P wave in the African (Bedford and Thomas, 1954). In Nigeria (Aroye, 1987; Edemeka and Ojo, 1996) tried to establish normal physiological values for the P wave in Nigerians. The P wave is due to atrial depolarization and increased amplitude of the P wave and duration is associated with atrial hypertrophy and dilatation or else an intra-atrial conduction abnormality (Macfarlane and L awrie, 1989).

In this study, we have made an assessment of P wave duration and amplitude and also derived significant correlations between P wave duration and amplitude and various anthropometric measurements.

Materials and Methods

One hundred and nine healthy adult Nigerians, all students of the University of Jos, volunteered for this study. They were aged between nineteen and thirty years. Males numbered ninety-five and females numbered fourteen. The study population consisted of students from a side range of tribes and ethnic groups in Nigeria. All the subjects were ambulant, asymptomatic and without evidence of cardiovascular or any other systemic illnesses. The protocol of study and all procedural techniques were critically assessed and approved by the medical committee of faculty of medical sciences of University of Jos. The test was carried out on those subjects who voluntarily presented themselves for the E.C.G. after informed consent was sought.

The ECG was recorded in the cardiovascular research laboratory of the Department of Human Physiology. The 12-lead E.C.Gs were recorded using grass model, 7 D polygraph (grass instrument, Co. Quincy, Mass. U.S.A). Preceding each ECG recording, the medical history, weight, height, chest circumference, pulse rate and the blood pressure of each subject were taken and recorded. The ECGs were recorded using a comfortable couch with the subjects lying in the supine position. A paper speed of 25 mm/sec was used during the recording of the ECG of each subject. The ECG machine was non – portable and was standardized at regular intervals to show a stylus deflection of 10mm per millivolt.

Statistical Analysis

All data in this study was summarized by undergoing treatment using the means as a measure of central tendency. Tests of measure of dispersion included analysis of standard deviation and the coefficient of variation. The standard error of the mean was also computed. T-tests for significance were determined and correlation regression analysis was also carried

out. Results in this study are presented as means ± standard error of mean.

Results

The subjects comprised a hundred and nine students of the University of Jos. Table 1 presents the mean values for P wave amplitude in millivolt and P wave duration in sec. Participants age ranged from 19 years to 30 years. The ranges for mean P wave voltage and duration were 0.07 ± 0.04 in lead avl and 0.09 ± 0.04 in lead a VR and 0.10 ± 0.02 in lead V3 respectively.

Table 1: Mean Values for the Duration and Voltage of P wave

LEADS	DURATION ± SD.(Sec)	VOLTAGE ± SD.(mV)
I	.10 ±.02	.08 ±.02
II	.09 ±.02	.10 ±.03
III	.09 ±.03	.09 ±.03
aVR	-.09 ±.04	.09 ±.02
aVL	.01 ±.07	.07 ±.04
aVF	.09 ±.02	.09 ±.02
V_1	.07 ±.04	.08 ±.02
V_2	.10 ±.03	.08 ±.03
V_3	.10 ±.02	.08 ±.02
V_4	.1 ±.02	.08 ±.02
V_5	.10 ±.03	.07 ±.03
V_6	.09 ±.04	.08 ±.05

Table 2: *Correlation Coefficients Between P wave and age and Blood Pressure.*

LEADS	AGE (YEARS)	SYSTOLIC BP (mmHg)	DIASTOTLIC BP (mmHg)
A VI TPW	-.2.385*	NS	.2410*
AVF TPW	.2147*	NS	NS
V_1 TPW	NS	-.1956*	NS
V_3 TPW	NS	NS	-.3706**
V_3 VPW	NS	-.1996*	NS
V_4 TPW	.2269*	NS	NS
V_4 VPW	NS	-.2696**	NS
V_6 VPW	NS	-.1924	NS
PMVM	NS	-.2350*	NS

Table 2 presents the correlation coefficients between P wave and age, systolic and diastolic blood pressures. Findings particularly noteworthy from table 2 are as follows:

i. There was a significant inverse correlation between P wave duration and age in lead avL ($r = -.23$; P<.05).

ii. There was a significant correlation between P wave duration and age in lead avF ($r = .21$; P<.05)

iii. There was a significant correlation between P wave duration and in lead V_4 ($r = .22$; p<.05).

iv. P wave amplitude was inversely correlated with systolic blood pressure in lead V_1 ($r = -.19$; P<.05).

v. P wave amplitude was inversely with systolic blood pressure in lead V_3 ($r = -.19$p<.05).

vi. P wave amplitude was correlated with the systolic blood pressure in lead V_4 ($r = .26$; p<.01).

vii. P wave amplitude was inversely correlated with the systolic blood pressure in lead V_6 ($r = -.19$; P<.05).

viii. P wave duration was correlated with the diastolic blood pressure in lead avL ($r = .24$; P<.05).

ix. P wave duration was inversely correlated with the diastolic blood pressure in lead V_3 ($r = -.37$; P<.01).

x. The mean P wave voltage was inversely correlated with the systolic blood pressure ($r = -.23$; P <.05).

From the multiple regression analysis, it was derived that the mean P wave voltage was = 0.04 − 0.0004 x systolic blood pressure is significant at 99.87% in prediction equation.

Discussion

Results presented from this study represent a heterogenous Nigerian population, living in the Jos highlands of Nigeria. Results of this study show that the mean P wave duration, was 0.07 ± 0.02 sec. This value fall within the normal range generally quoted for P wave duration (Araoye, 1987; macfarlane and Lawrie, 1989).

The results of the present study show that the mean P wave amplitude was 0.087 ± 0.0082 mV. This value is slightly than values quoted for Caucasians. It is known that ECG variables differ in the various human races. The reason for this racial disparity in P wave amplitude may need further investigation. The largest P wave amplitude, was seen in lead 11: 0.105 ± 0.03, mV. This finding verifies the work of earlier investigators: (Araoye, 1987; Mehta, 1993; Rowland, 1991). This study has documented a prediction equation for the mean P wave voltage and the systolic blood pressure thus: mean P wave voltage = 0.04 − 0.0004 x systolic blood pressure.

In summary, the present study has established normal values for the P wave

duration and amplitude. It has also established a prediction equation for the mean P wave voltage and the systolic blood pressure. These normal values may provide reference guide for the interpretation of ECG studies in Jos Nigeria.

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