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Original Research Paper

Physiology

RELATIONSHIP OF ELECTROCARDIOGRAM VARIABLES WITH BLOOD PRESSURE IN UNDERGRADUATE MEDICAL STUDENTS.

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ABSTRACT

INTRODUCTION: Across the world the prevalence of hypertension and other cardiovascular diseases are increasing at an alarming rate. These diseases also affect the young age and medical students are no exception. In this study, ECG variables like R-R interval, QRS Axis of the medical students along with their Blood pressure were recorded and the relationship between ECG variables and Blood pressure was studied.

MATERIALS AND METHODS: The study was done in Dept. of Physiology, Jorhat Medical College .Sample size was calculated as 160 using EpiTools Software. Recording of Electrocardiogram and Blood pressure of 160 students were done and saved for further analysis. P values were calculated by Anova test in case of more than two variables,. Scatter diagrams were used to see the relationship between study variables. The P value <0.05 was considered as significant.

RESULTS: Comparison of ECG Variables between hypotensive, normotensive and hypertensive students showed that R-R Interval decreased significantly from 21.37 ± 4.24 in hypotensives to 19.74 ± 3.39 in normotensives and 18.27 ± 4.07 in hypertensive students. QRS Axis decreased from 75.35 ± 10.99 degrees in hypotensives to 54.80 ± 34.94 degrees in normotensives and 50.43 ± 25.59 degrees in hypertensive students.

CONCLUSION: Changing of life style that includes reduced consumption of fat rich diets, fast foods, red meat and salt, performing regular physical exercises, and regular health check up in the form of Blood pressure and Electrocardiogram recording could be beneficial for the students to identify and take preventive measures against any cardiovascular ailments.

KEYWORDS : Medical students, QRS Axis, R-R Interval, Blood Pressure.

INTRODUCTION

Across the world the prevalence of non communicable diseases are increasing at an alarming rate. Among them hypertension and other cardiovascular diseases are common. Cardiovascular disease (CVD) is a major cause of disability and premature death throughout the world. There are obvious signs of cardiovascular diseases that can be seen long before they occur.[1]The fatal complications of CVD are usually seen in middle-aged or elderly people. However, the pathological processes begins early in life and progresses gradually through adolescence and early adulthood. Thus, these cardiovascular diseases also affect the younger generation and medical students are no exception.

In cardiac medicine, resting Electrocardiogram(ECG) has proved its value as a diagnostic tool for detecting "silent" heart disease.[2,3]Apart from its use in the clinical field, the ECG has also been employed as a prognostic tool in relatively healthy subjects. Therefore, accurate estimation of the true prevalence of ECG abnormalities in large samples helps in interpretation of the predictive value of ECG findings.[4]

So to make the medical students aware and to sort out the risk factors affecting cardiac health, resting electrocardiography (ECG) is done as it serves as a better guide for risk-reduction therapies.[5]

There is also growing incidence of hypertension occurring in younger ages as compared to older age groups in the past. It affects nearly a quarter of the adult population worldwide.[6] Hypertension is an independent predictor of cardiovascular diseaseas. Such studies were done among young students in other parts of the world.[7]

Medical students being the future physicians must be aware of their own health. In the present study an attempt has been made to assess Electrocardiographic parameters(R-RInterval ,QRS Axis) and Blood pressure(BP) of medical students and to find the relationship between them.

MATERIALS AND METHODS

The present study was done in Dept. of Physiology, Jorhat Medical College. It was an institution based cross-sectional observational study. Study population included undergraduate medical students of Jorhat Medical College. Sampling technique was simple random sampling. Considering prevalence of obesity as 24% [8] and 11% as desired precision under 95% confidence interval, sample size was calculated and rounded up to 160 using EpiTools Software.

The study included students volunteers of age 17-25 years who were non-smokers and gave consent for the study.The study excluded those students who did not take part in all the tests procedures required for the study. Ethical Clearance was obtained from Institutional Ethical Committee (H), Jorhat Medical College, Jorhat.

Procedure Of Recording Electrocardiogram

The Model BPL CARDIART 108T-DIGI with single channel ECG recorder was used.The recordings were carried out according to the specifications of the American Heart Association, i.e. subjects lying supine with arms on sides, limb electrodes on the wrists and ankles, recording done at 25 mm/sec and calibrated at 10 mm/mV.

Informed written Consent was taken from all the students (both male and females). For the female students, the ECGs were conducted with the help of a female Lab attendant. The name of the subject with date and time of the recording was put on the recorded graph and the ECG jelly was removed using cotton. Heart rate (R-R Interval), QRS duration, frontal plane QRS axis from the ECGs were evaluated and then entered in computer and stored for further analysis.

Measurement Of Blood Pressure (bp):-

Littman 3M Classic stethoscope was used. Diamond BPMR 120 Conventional Mercurial Type BP Machine was used.BP was recorded in a quiet, warm setting. The subject was asked to sit quietly with the back supported for five minutes and the arm supported at the level of heart. The subject was advised not to take any caffeine or exogenous adrenergic stimulants during the hour preceding the recording.

Before recording the blood pressure, it was ensured that the upper meniscus of the mercury coincided with the 'zero' of the

mercury manometer. The BP was taken with subject's outstretched right upper limb over the brachial artery, applying a cuff just above cubital fossa, using a mercury sphygmomanometer kept at level of subjects' heart in sitting position. Systolic blood pressure was first recorded by palpatory method and then systolic and diastolic blood pressure were recorded by auscultatory method. **Categories of BP Used were as per** American Heart Association 2017 Hypertension Guidelines.[9]

Statistical Analysis

The response frequencies and descriptive statistics like mean and standard deviation were calculated and analyzed by using MS Excel. In case of more than two variables, P values were calculated using Anova Test by Interactive statistics software.. Scatter Diagrams were used to see the relationship between Study Variables. The P value <0.05 was considered as significant & P<0.01 and P<0.001 was considered as highly significant and extremely highly significant respectively.

RESULTS

Distribution of Blood Pressure profile among 160 participants showed that, 119 students (74.38%) were normotensive, 33 students (20.62%) were hypertensive & 8 students (5%) were hypotensive.**(Figure 1)**

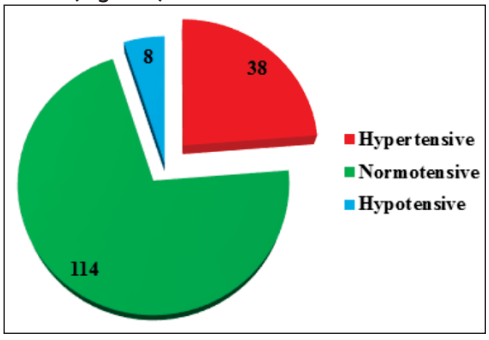

Figure 1 : Distribution of normotensives, hypertensives and hypotensives among the participants.

Comparison of ECG Variables between hypotensive, normotensive and hypertensive students showed that R-R Interval decreased from 21.37±4.24 in hypotensives to 19.74±3.39 in normotensives and 18.27±4.07 in hypertensive students . This finding came to be significant by Anova (p value 0.0393).**(Table 1).**

QRS Axis decreased from 75.35±10.99 degrees in hypotensives to 54.80±34.94 degrees in normotensives and 50.43±25.59 degrees in hypertensive students. However, this finding was found to be insignificant by Anova(p value 0.1536). Heart rate increased from 73.01±15.00 beats/min in hypotensives to 78.12±12.89 beats/min in normotensives and 85.69±16.49 beats/min in hypertensives. This comparison was found to be significant by Anova.(p value 0.0095) **(Table 1).**

Table 1: Comparison of ECG Variables between hypotensives, normotensives and hypertensives:

Parameters (Mean±sd)	Hypotensives (n=8)	Normotensives (n=119)	Hypertensives (n=33)	P value
R-R Interval	**21.37±4.24**	**19.74±3.39**	**18.27±4.07**	**0.0393***
QRS Axis (degrees)	**75.35±10.99**	**54.80±34.94**	**50.43±25.59**	**0.1536**
Heart rate (beats/min)	**73.01±15.00**	**78.12±12.89**	**85.69±16.49**	**0.0095***

*statistically significant

We found negative linear relationship of QRS Axis with Systolic BP i.e as Systolic BP increased, QRS axis shifted towards left.**(Figure 2)**

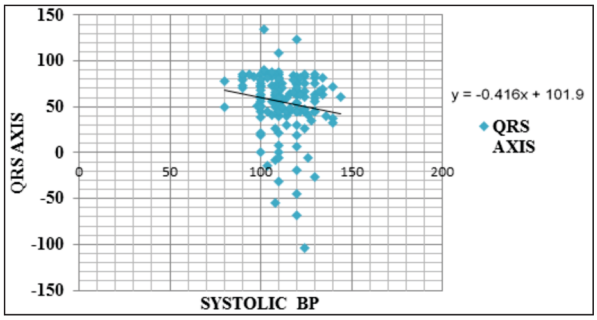

Figure 2: Scatter diagram showing relationship of QRS Axis with Systolic BP

Negative linear relationship of QRS Axis with Diastolic BP i.e as Diastolic BP increased, QRS axis shifted towards left.**(Figure 3)**

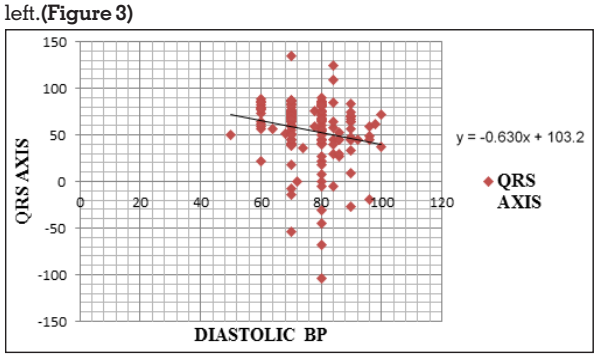

Figure3: Scatter diagram showing relationship of QRS Axis with Diastolic BP

DISCUSSION

Our Study found that with increase in blood pressure, there is decrease in R-R Interval i.e there is increase in Heart rate as BP increases. This finding came to be significant by Anova test. This study also found that with increase in both SBP and DBP, there is leftward shift of QRS Axis.

This was similar to the findings of Kuroda Kenje et al [10] and Alpert et al[11]. The latter study found similar results in normotensive obese patients (>twice the ideal weight) compared to healthy normotensive subjects.[11]

The physiological basis can be explained by the fact that when one ventricle is hypertrophied ,the axis of the heart shifts toward the hypertrophied ventricle. This is because greater quantity of muscle exists on the hypertrophied side of the heart than on the other side. So, greater electrical potential is generated on that side. Secondly, more time is required for the depolarization wave to travel through the hypertrophied ventricle than through the normal ventricle. So, the normal ventricle becomes depolarized first, then the hypertrophied ventricle, and this causes a strong vector from the normal side of the heart toward the hypertrophied side. [12]

Hypertension (high arterial blood pressure), causes the left ventricle to hypertrophy to pump blood against elevated systemic arterial pressure. Thus, in this case, left axis deviation occurs.[12]

India has an increasing trend of hypertension especially among the urban population due to economic development and modernization with changing lifestyle factors.[13] Sedentary life style, intake of calorie rich junk foods and automated working profile has made the environment conducive for high prevalence of non communicable diseases(NCDs).

The rate of progression of disease is influenced by

cardiovascular risk factors like unhealthy diet, tobacco use, physical inactivity (which together result in obesity) and elevated blood pressure, (hypertension).Continuing exposure to these risk factors leads to further progression of the diseases, resulting gradually in atherosclerosis, narrowing of blood vessels and obstruction of blood flow to vital organs, such as the heart and the brain leading to mortality.[14]The socioeconomic development has changed the dietary intake, food consumption patterns, and physical activity levels over the years contributing to the problem of increasing cardiovascular diseases among the population.[15]

Study Limitations:

This study was a Cross sectional study; as such the casual relationship of the risk factors could not be established. The data collection could not be generalized as it was was limited to students from a single institution.

Another limitation of the study was that our study was limited only to R-R Interval and QRS Axis and did not include other ECG parameters.A single BP recording was taken because of time constraints as students had to go for their classes and clinical postings.Furthermore, it remained to be investigated whether left shift of QRS axis in the hypertensiveswas based on increased LVH because detailed echocardiographic assessments were lacking which leaves scope for further study.

CONCLUSION

Our study showed that increase in blood pressure is associated with increase in heart rate and leftward shift of QRS axis. We recommended for changing life style that includes reduced consumption of fat rich diets, fast foods, salt restriction, performing regular physical exercises, yoga, meditation, sticking to a routine time table for sports, study and sleeping hours.

Regular health check up in the form of blood pressure measurement, recording of Electrocardiogram could be beneficial for the students to prevent hypertension, cardiovascular diseases and the risk factors associated with it.

It is highly desirable for such studies to be initiated so as to tackle the burden of noncommunicable diseases among thenew-generation physicians.

REFERENCES

1) Eisenstein I, Edelstein J, Sarma R, Sanmarco M, Selvester RH. The electrocardiogram in obesity. Journal of electrocardiology. 1982 Jan 1; 15(2): 115-8.
2) Fye WB. A history of the origin, evolution, and impact of electrocardiography. The American journal of cardiology. 1994 May 15;73(13):937-49.
3) Sox Jr HC, Garber AM, Littenberg B. The resting electrocardiogram as a screening test: a clinical analysis. Annals of internal medicine. 1989 Sep 15; 111(6): 489-502.
4) Blackburn H, Keys A, Simonson E, Rautaharju P, Punsar S. The electrocardiogram in population studies: a classification system. Circulation. 1960 Jun;21(6):1160-75.
5) Alpert MA, Terry BE, Cohen MV, Fan TM, Painter JA, Massey CV. The electrocardiogram in morbid obesity. American Journal of Cardiology. 2000 Apr 1;85(7):908-10.
6) Sinha DL. Prehypertension, Heart rate, Obesity and their co-relation; Survey on Medical Students. Gujarat medical journal. 2015 Jul;70(2).
7) Erikssen G, Bodegard J, Bjørnholt JV, Liestøl K, Thelle DS, Erikssen J. Exercise testing of healthy men in a new perspective: from diagnosis to prognosis. European heart journal. 2004 Jun 1;25(11):978-86.
8) Satyanarayana P, Roy M, Parma C, Mounika V, Ravuri S, Manaswi C, Srishti PD. Assessment of Lung Functions in Obese Young Adolescent Medical Students. J Dental Med Sci. 2014;13:17-20.
9) Whelton PK, Carey RM, Aronow WS, Casey DE, Collins KJ, Himmelfarb CD, DePalma SM, Gidding S, Jamerson KA, Jones DW, MacLaughlin EJ. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. Journal of the American College of Cardiology. 2018 May 7;71(19):e127-248.
10) Kuroda K, Ogawa T, Kojima S, Wakimoto T, Seki A, Fujii M. Relationship between Exercise-induced QRS Axis Shift and Multiple Risk Factors for Coronary Heart Disease. (Ningen Dock). 2012;26(6):945-50.
11) Alpert MA, Terry BE, Cohen MV, Fan TM, Painter JA, Massey CV. The electrocardiogram in morbid obesity. American Journal of Cardiology. 2000 Apr 1;85(7):908-10.
12) Hall JE, AC G. Guyton and Hall textbook of medical physiology. 13th Edition.
13) Gupta R. Trends in hypertension epidemiology in India. Journal of human hypertension. 2004 Feb;18(2):73-8.
14) World Health Organization. Prevention of cardiovascular disease. World Health Organization; 2007.
15) Mungreiphy NK, Kapoor S, Sinha R. Association between BMI, blood pressure, and age: study among Tangkhul Naga tribal males of Northeast India. Journal of Anthropology. 2011;2011.