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Research Article

A study of electrocardiographic changes in type 2 diabetes patients

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ABSTRACT

Background: Cardiovascular system has been involved in patients with diabetes in various ways. It is very important to know the electrocardiographic changes that can occur in patients with diabetes.
Methods: The electrocardiographic changes were studied in 50 cases with diabetes and compared with 50 healthy age and sex matched controls.
Results: Among the 18 females and 32 males included in the study, only 10 patients had diabetes of more than 10 years duration. The various electrocardiographic changes were poor progression of R waves (18%), Q waves (10%), bundle branch blocks (8%), QT prolongation (8%), ectopics (6%), axis changes (6%), heart blocks (6%), rate abnormalities (8%) and chamber enlargement (6%).
Conclusions: This study reflects that resting ECG should be an integral part of the examination of all patients with diabetes.

Keywords: Electrocardiographic, Diabetes

INTRODUCTION

The importance of diabetes, in the epidemiology of cardiovascular diseases cannot be overemphasized. About one third of patients with acute myocardial infarction have diabetes, the prevalence of which is steadily increasing.[1] The involvement of cardiovascular system in diabetes mellitus is varied. It can be involved by microvascular and macrovascular pathology. The cardiovascular system involvement in patients with diabetes can range from ischemic heart disease, hypertensive heart disease and diabetic cardiomyopathy.[2]

The 12-lead ECG has maintained its significance for the diagnosis and triage of patients with suspected coronary heart disease. It is utilized both in the diagnostic and the researcher quest as a detection and screening tool of myocardial injury. In the present paper, we aimed to study the ECG changes in terms of their relevance to the clinician to help with the day to day diagnosis, screening, and timely decision making and also in terms of their application in the future and ongoing research.

METHODS

Source of data

The data was included from 100 subjects attending outpatient and inpatient services in Father Muller Medical College Hospital, Mangalore. This study was approved by the ethical committee of the Hospital.

Method

The electrocardiographic changes were studied in 50 cases of patients with diabetes and compared with 50 healthy age and sex matched controls.

Inclusion criteria

1. Type 2 Diabetes Mellitus patients either symptomatic or asymptomatic.
2. Healthy controls.

Exclusion criteria:

1. Patients with age above 65
2. Documented ischemic heart disease
3. History suggestive of previous angina, congestive cardiac failure.
4. Documented evidence of other cardiac disease like cardiomyopathy, Valvular heart disease, Congenital Heart Disease, Myocarditis
5. Alcoholism as defined by CAGE criteria
6. Hypertension
7. Chronic obstructive pulmonary disease
8. Drugs – β blockers, Digoxin
9. Features of hypothyroidism
10. Uremia
11. Random blood sugar > 140 mg/dL for the controls.

Study design

This study is a prospective observational case control study done on inpatients and outpatients in Father Muller Medical College Hospital. The study included a total of 100 subjects (50 cases and 50 controls).

Data analysis

Data was tabulated and analysed by frequency, mean, percentage and standard deviation.

RESULTS

The electrocardiographic changes studied in 50 cases of patients with diabetes and compared with 50 healthy age and sex matched controls were analyzed as given below.

Sex distribution of cases

The study included 50 cases and 50 controls, of which there were 18 females and 32 males in both cases and controls.

Duration of diabetes

Based on duration of diabetes, there were 21 patients with duration of diabetes less than 3 yrs, 19 with duration between 3 to 6 yrs and 10 patients with duration of diabetes more than 6 yrs both in cases and controls.

Both cases and controls were age and sex matched. Most patients were in 51-60 years age group. Mean age was 55.52 yrs (Figure 1).

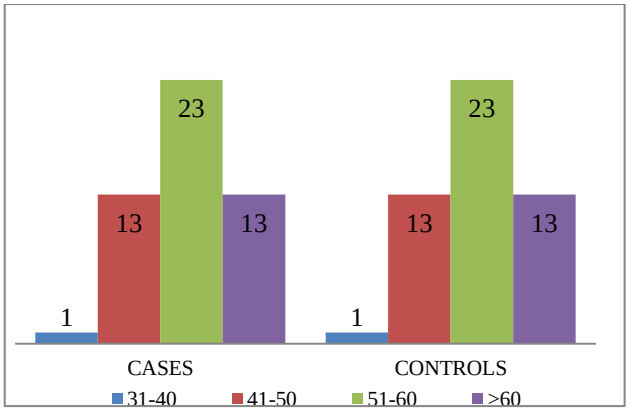
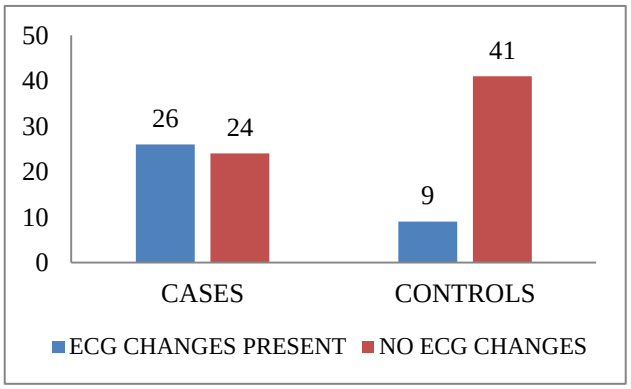


Figure 1: Age distribution of cases and controls.



Pearson Chi-square test; P <0.001; N=50; Cases=50; Controls=50

Figure 2: Presence of ECG changes.

Among the cases, 52% (26) of them had various ECG changes whereas among the controls ECG changes were present only in 18% (9) of patients. This was statistically significant with p value <0.001 based on Pearson's chi square test. Of the 50 cases studied 18% (9) had ST-T changes, whereas only 2% (1) had ST-T changes among the controls which was statically significant (p<0.001).

Overall all ECG changes were more common among the cases when compared to controls, but few changes which did not have statistical significance but were more common among the cases were Heart Blocks(6% v/s 4%) and chamber enlargement (6% v/s 2%). The presence of Q waves (10% v/s 0%), Poor R wave progression (16% v/s 6%), ectopics (6% v/s 0%), Bundle branch blocks (8% v/s 2%), QT Prolongation (8% v/s 0%), chamber enlargement (6% v/s 2%) and axis deviation (6% v/s 0%) was statistically significant (Figure 3).

Relation between glycosylated hemoglobin (Glyco Hb) and ECG changes

It was also found that among cases those who had higher Glyco Hb values (>8.5) had more ECG changes (38%) where as those with lower Glyco Hb values had less ECG

changes (14%). This was found to be statistically significant (p <0.001 of Fischer's exact test).

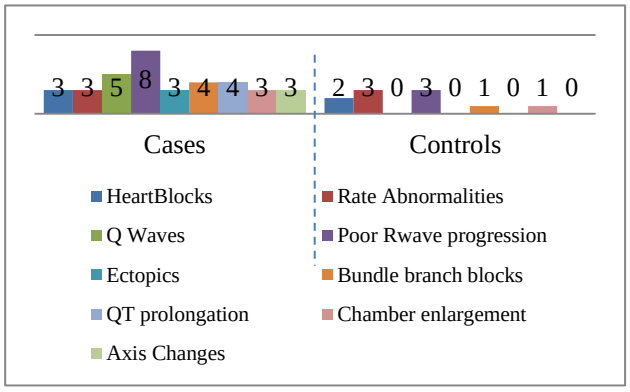


Figure 3: Various ECG changes in cases vs. controls.

DISCUSSION

All diabetic patients should be evaluated by meticulous history, physical examination besides resting ECG. Resting ECG is the most essential and initial test that should be done in all asymptomatic diabetics and can be used for screening of all patients with diabetes.

Often in research, a more sophisticated and invasive test is done, however our study utilizes a noninvasive and cheaper tool which can be used in all patients in developing countries like India.

The mean age of presentation in our study is 55.52 years. Most subjects were in the 51-60 years category. Similar age ranges were found in various Indian studies. [3,4,5] study done Gwalior, Madhya Pradesh.[3] The male to female ratio in this study was 1.78:1 which is comparable to the various studies done in India.[3,4,5]

The presence ECG change in subjects with type 2 diabetes in this study was 52%. Overall all ECG changes were more common among the cases when compared to controls, but few changes which did not have statistical significance but were more common among the cases were heart blocks(6% v/s 4%) and chamber enlargement (6% v/s 2%).

The presence of Q waves (10% v/s 0%), poor R wave progression (16% v/s 6%), ectopics (6% v/s 0%), bundle branch blocks (8% v/s 2%), QT Prolongation (8% v/s 0%), chamber enlargement (6% v/s 2%) and axis deviation (6% v/s 0%) was statistically significant.

A study done on the quantitative electrocardiographic and vectorcardiographic changes carried in 113 newly diagnosed diabetics and 125 controls showed statistically significant QT prolongation in the diabetic group.[6]

A study done on 9135 men and 9627 women showed that there was statistically significant relationship between right bundle branch block and elevated fasting plasma glucose.

Diabetics have a prolonged PR interval and more leftward frontal QRS axis than their non diabetic counterparts.[7] Another study showed no statistically significant difference in QRS duration between diabetics and non diabetics. There is an increase incidence of intraventricular conduction blocks in diabetic patients than that of normal however this was not statistically significant.[8]

CONCLUSION

This study reflects that there is a resting ECG should be an integral part of the examination of all patients with diabetes.

This study emphasizes that presence of ST-T changes, Q waves; Poor R wave progression, ectopics, bundle branch blocks, QT Prolongation, chamber enlargement and axis deviation are more common in diabetic patients.

The ECG changes were seen more commonly in patients with poorly controlled diabetes, which reinforces the need to have well controlled blood glucose levels in all patients with diabetes to prevent its complications.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Schnell O, Otter W, Standl E. The Myocardial Infarction Registry: translating the European Society of Cardiology (ESC) and European Association for the Study of Diabetes (EASD) guidelines on diabetes, pre-diabetes, and cardiovascular disease into clinical practice. Diabetes care. 2009;32:326-30.
2. Voulgari C, Papadogiannis D, Tentolouris N. Diabetic cardiomyopathy: from the pathophysiology of the cardiac myocytes to current diagnosis and management strategies. Vascular Health and Risk Management. 2010;6:883-903.
3. Singh S, Singh AP, Multani MK, Purohit A. Clinical and biochemical profile of Indians with type 2 diabetes mellitus: A problem lurking for India. Trop J Med Res. 2014;17:91-8.
4. Agrawal RP, Ranka M, Beniwal R, Gothwal SR, Jain GC, Kochar DK, et al. Prevalence of micro and

macro vascular complications in type 2 diabetes and their risk factors. Int J Diabetes Dev Ctries. 2004;24:11-6.
5. Sinharoy K, Mandal L, Chakrabarti S, Paul UK, Bandyopadhyay R, Basu AK. A study on clinical and biochemical profile of low body weight type 2 diabetes mellitus. J Indian Med Assoc. 2008;106:747-50.
6. Uusitpa M, Mustonen J, Siitonen O, Pyorala K. Quantitative electrocardiographic and vector cardiographic study on newly diagnosed non-insulin-dependent diabetes and non diabetic control subjects. Cardiology. 1988;75:1-9.
7. Thrainsdottir IS, Hardarson T, Thorgeisson G, Sigvaldason H, Sigfusson N. The epidemiology of right bundle branch block and its association with cardiovascular morbidity. Eur Heart J. 1993;14:1590-6.
8. Pouroghaddas A, Hekmatnia A. The relationship between QTc interval and cardiac autonomic neuropathy in diabetes mellitus. Mol Cell Biochem. 2003;249:125-8.

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