The prevalence of persistent QTC prolongation in type 2 diabetes mellites

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Abstract
Background: Prolonged QTc interval in type 2 diabetes mellitus is associated with significant cardiovascular mortality. The prevalence of QTc prolongation in type 2 Diabetes mellitus is 24%. **Methods:** Cross – sectional prospective study of subjects with type 2 diabetes mellitus attending the inpatient and outpatient services of Amala institute of medical sciences. Repeat ECG is taken in patients with prolonged QTc and thus the prevalence of persistent QTc prolongation is calculated. **Results:** of the 289 patients with type 2 diabetes mellitus. 114 patients (prevalence=39.4%) had QTc prolongation. Only 96 of those 114 patients had QTc prolongation 4 weeks later (prevalence=33.2%). Of the 289 patients 34.25% (n=99) had microvascular complications and 44.98% (n=130) had macrovascular complications. **Conclusion:** The prevalence of persistent QTc prolongation in type 2 diabetes mellitus from the study was 33.2%. 6.2% (n=18) individuals had prolonged QTc interval only in the first ECG. So, in diabetic patients conclude that there is QTc prolongation you need two different ECGs taken at 2 different occasions.
Key Word: QTC prolongation.

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INTRODUCTION

Diabetes mellitus is one of the greatest challenges of the 21st century. The etiology of diabetes in India is due to number of factors including genetic factors coupled with obesity, rising living standards and lifestyle changes[1]. QT interval is the interval between the beginning of QRS complex to the ending of the T wave on surface ECG[2]. It represents the time taken from the onset of depolarization to the completion of repolarization of myocardium[2]. The interval has a great problem with its variation with age, sex, sympathetic tone, and diurnal pattern[3]. Its variation with the heart rate has resulted in the calculation of QTc. QTc intervals of 450ms and 460ms are considered as the upper limits in adult men and women respectively[4]. QT prolongation causes lowered ventricular fibrillation threshold[5,6]. This mainly occurs due to nonuniform recovery of the myocardial excitability[7]. A study conducted in patients with recent myocardial infarctions proved to be an indicator of sudden cardiac death[8] The cardiovascular mortality is more in diabetes mellitus is higher than in normal population[9]. Coronary artery disease accounts for 65 to 80% of deaths in diabetic patients[10]. Diabetic cardiomyopathy is a distinct entity which is independent of ischemic heart disease, systemic hypertension or other macrovascular complications[11]. This condition is characterized by damage of myocardium, disturbance of management of metabolic cardiovascular load, and cardiovascular autonomic neuropathy[12]. There is both QT dispersion and QTc. QT dispersion is the mean difference between the QT maximum and QT minimum interval in all leads. Both QT dispersion and QTc have been demonstrated independently as markers of cardiovascular mortality. In a 5-year prospective study conducted on diabetic patients with QTc interval >460 ms cardiovascular mortality doubles.[13]. In this study we are trying to find out whether serial ECG recordings on 2

different occasions are necessary to brand that a patient has QTc prolongation.

MATERIALS AND METHODS

A cross sectional study conducted in the department of General Medicine department in Amala Institute of Medical sciences, Thrissur, Kerala from January 2016 to June 2017, that evaluated 289 patients who were found to have type 2 Diabetes mellitus. Detailed history and clinical examination were done. QTc interval was calculated using the bazett's formula. In those patients who had prolonged QTc, ECG was repeated. QTc was recalculated. Thus, the prevalence of persistent QTc prolongation were estimated. In the process systemic hypertension, dyslipidemia, microvascular complications and macrovascular complications and their association with persistently prolonged QTc prolongation were estimated. The associations were found using chi square test. The associations between duration of diabetes, treatment given and persistent QTc prolongation were estimated using fisher's test.

RESULTS

The study was conducted to find out the prevalence of persistent prolongation of QTc interval in type 2 diabetes mellitus. A total of 289 people was involved in the study. The results were tabulated below. Table-1 shows the difference between number of patients with QTc prolongation on one occasion and comparing it with patients with persistent QTc prolongation. It shows that a total of 6.2% (18) had QTc prolongation only on one occasion.

Table 1:

QTc prolongation	Counts	Persistent QTc prolongation	Counts
Yes	114(39.4%)	Yes	96(33.2%)
No	175(60.6%)	No	193(66.8%)
Grand Total		289(100%)	

The study also found positive correlation between microvascular complications of type 2 DM and persistent QTc prolongation. There is no significant correlation between macrovascular complications of type 2 DM and persistent QTc prolongation. Table 2 shows the p value of the chi – square test of microvascular complication with persistent QTc prolongation. The study showed no significant correlation between macrovascular complication with persistent QTc prolongation.

Table 2:

Microvascular complication	P value (chi square test)
Diabetic neuropathy	0.002
Diabetic retinopathy	0.047
Diabetic nephropathy	0.000284

DISCUSSION

In the study conducted we found out the prevalence of persistent prolongation of QTc interval in type 2 diabetes mellitus. Prevalence of persistent QTc prolongation has not been calculated before. According to Veglio *et al* the prevalence of QTc prolongation was 25.8%. Our study showed the prevalence of QTc prolongation to be 39.4%. But the prevalence of persistent QTc prolongation was 33.2%. In the study 31.8% were between 61-70 years of age of which males 31.5%(n=53) and females were 32.2%(n=39). Microvascular and macrovascular complications of patients in the study were compared with the persistent QTc prolongations. Microvascular complications compared were diabetic retinopathy, diabetic neuropathy, diabetic nephropathy. 34.25%(n=99) of the patients in the study had microvascular complications. Macrovascular complications compared were peripheral vascular disease, coronary artery disease, cerebrovascular accident. 44.98%(n=130) had macrovascular complications. In the study there was a significant number of patients who had QTc prolongation on only one occasion. So, it is necessary to take ECG on at least 2 occasions to confirm that the ECG of the patient has significantly prolonged QTc.

CONCLUSION

In our study we found that people with type 2 diabetes mellitus had significant prolongation of QTc interval. Also, we have found that there was a significant number who had QTc prolongation on the first occasion only. Thus, we have concluded that to confirm that a patient has QTc prolongation it is necessary to demonstrate QTc prolongation on two separate occasions

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