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## To Study The Association of QTc Interval Changes In Smokers.

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### ABSTRACT

The electrocardiogram (ECG) is the graphical recording of the electrical activity of the heart recorded from the body surface by electrodes positioned to reflect activity from variety of spatial perspectives. QT interval is of potential use in cardiovascular risk profiling. Acute and chronic smoking alters QT interval duration. In this study we are studying the association between QTc interval in smokers. Study was conducted in male individuals above 18 years age group selected from the general population. Smokers were selected as per World Health Organisation (WHO) 10<sup>th</sup> revision of International Statistical Classification of Diseases and related health problems (ICD-10) criteria of harmful use, Subjects were grouped into control and smokers. Each group consists of 50 subjects. QT<sub>c</sub> interval is determined using modified Bazett's formula. QT<sub>c</sub> interval values (in seconds) were  $0.40 \pm 0.06$ ,  $0.45 \pm 0.04$ , among controls and smokers respectively. There was prolongation of QTc Interval in smokers compared to controls which was statistically significant. Cigarette smoking was associated with prolongation of the QTc interval. It may be due to autonomic dysfunction, and may be implicated with an increased cardiovascular risk in this population.

**Keywords:** Electrocardiogram, QTc interval, Smoking,

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## INTRODUCTION

The electrocardiogram (ECG) is the graphical recording of the electrical activity of the heart recorded from the body surface by electrodes positioned to reflect activity from variety of spatial perspectives [1]. ECG is one of the easiest and simple methods of assessing the cardiovascular status. It is noninvasive, inexpensive, and versatile test and used in detecting arrhythmias, conduction disturbances, and myocardial ischemia, and other cardiac abnormalities [2]. ECG parameters like heart rate. QTc interval helpful in identifying the risk factors affecting cardiovascular system. The QT interval is of potential use in cardiovascular risk profiling [7]. Various western studies have associated between prolongation of QT interval with mortality [3]. During the last decade, the heart rate adjusted QT interval or QTc interval and its dispersion is being increasingly associated with diagnosis of various cardiac abnormalities [4].

Prolongation of the QT interval corrected for heart rate (QTc) is associated with a lowered ventricular fibrillation threshold and other potentially lethal arrhythmias, as polymorphic ventricular tachycardia (torsades de pointes), and has been proven to be an independent risk factor for sudden cardiac death (especially QTc values >440 ms), both in the general population [6].

Abnormalities in the electrocardiographic QT interval duration have been associated with an increased risk of ventricular arrhythmias and sudden cardiac death. Studies show association of modifiable factors like coffee intake, cigarette smoking, alcohol consumption, and physical activity with QT interval duration [6]. Studies have shown the influence of acute and chronic smoking on QT interval duration. Studies have reported longer QT intervals in smokers compared to non-smokers [7,8]. Another study showed that smoking cessation reduced the QT interval [9]. In this study we are studying the association between QTc interval and smokers.

## MATERIALS AND METHODS

The study was carried out in the Sri Siddartha Medical College, Tumkur. Subjects were male individuals above 18 years age group selected from the general population. After explaining the nature and purpose of the study, participants who are interested were included in the study. Informed consent was obtained. Subjects were grouped into control and smokers. Each group consists of 50 subjects. A detailed history like name, age, occupation, address, smoking history, personal history, family history and past history was taken. Smoking history was taken including, number of cigarettes per day, duration, type and others. Smokers were selected as per World Health Organisation (WHO) 10<sup>th</sup> revision of International Statistical Classification of Diseases and related health problems (ICD-10) criteria of harmful use [10].

QTc interval recorded with single channel electrocardiograph Cardiant 108T-MK-VI manufactured by BPL Electronics Ltd. QTc interval measured from the beginning of QRS complex to the end of T-wave. It is rate dependent and must be corrected for heart rate (QT<sub>c</sub>). QT<sub>c</sub> interval is determined using modified Bazett's formula by Hodges and co-workers. It corrects more completely for high and low heart rates [11].  $QT_c = QT + 0.00175 (\text{Heart rate} - 60)$ .

## RESULTS

We have studied the acute effects of cigarette smoking on QT interval. QT<sub>c</sub> interval measures the duration of electrical activation and recovery of the ventricular myocardium and varies inversely with the cardiac rate. The upper limit of the duration of the QTC interval is approximately 0.46 seconds (450 milli seconds). In our study QT<sub>c</sub> interval values (in seconds) were  $0.40 \pm 0.06$ ,  $0.45 \pm 0.04$ , among controls and smokers respectively. (Table-1, Fig-1) QT<sub>c</sub> interval was prolonged in smokers compared to controls which were statistical significant ( $p < 0.05$ ).

### Statistical Analysis

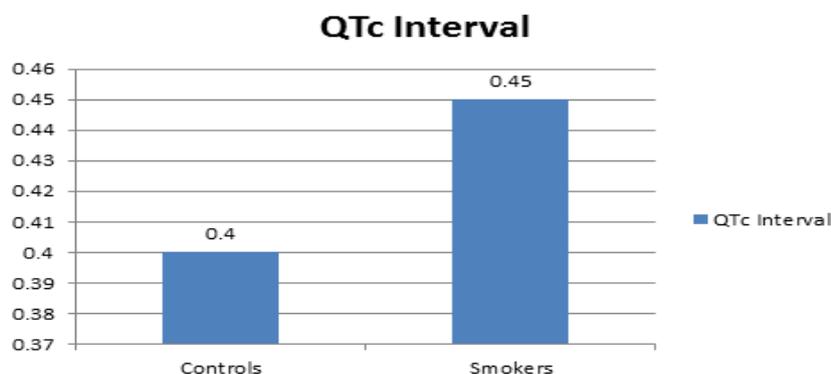
Continuous variables are presented as Mean  $\pm$  SD and Range values. Group comparison were made by one way ANOVA followed by student 't' test for pairwise comparison. A p value of 0.05 is less ( $p < 0.05$ ) was considered for statistical significance.

**Table 1: Comparison of QTc interval between smokers & controls**

Parameters	Controls	Smokers	p-value
QTc Interval (s)	0.40 ± 0.06	0.45 ± 0.04	P<0.05*

P<0.05\* - statistically significant

**Figure 1: QTc interval between smokers & controls**



### DISCUSSION

QT<sub>c</sub> interval in the electrocardiogram reflects the time registered for depolarization and repolarization in the ventricular myocardium. Karjalainen et al [12] reported that smoking was associated with shorter QT<sub>c</sub> than non smokers. The age group in their subjects was between 35-59 years and smoked for 8 years. Smoking increases sympathetic tone and heart rate variability in smokers point to decrease in the vagal control of heart. In our study there was increase in QTc interval which was similar to study by Dilaveris et al [7]. It is well known that cigarette smoking alters autonomic cardiac control [13]. Since cigarette smoking is a modifiable risk factors for heart disease [14], quitting of smoking helps in altering the QTc interval.

To conclude, our study showed that cigarette smoking was associated with prolongation of the QTc interval. It may be due to autonomic dysfunction, and may be implicated with an increased cardiovascular risk in this population.

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