# **ORIGINAL ARTICLE**

# Frequency of QTc Interval prolongation in Patients of Non-ST Elevation Myocardial Infarction

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### ABSTRACT

**Objective:** To determine the frequency of QTc interval prolongation in patients of non-ST elevation myocardial infarction

**Material and methods:** This cross-sectional study was carried out at cardiology department of Liaquat University of Medical and health sciences. Study was conducted during 6 months from September 2019 to February 2020. All the patients who were presented with Non-ST elevation myocardial infarction, age more than 25 years and either of gender were included. All patients underwent the resting ECG. QTc values were computed from lead II. The QTc greater than 440 ms in males and 460 ms in females was considered as prolonged. All the data was recorded via study proforma. Data analysis was done by using SPSS 20.

**Results:** Total 103 patients has been studied, their mean age was 59.28+13.04 years. Most of the patients 72(69.9%) were illiterate, followed by 05(04.9%) cases had primary level education, 08(07.8%) were middle passed and 18(17.5%) were graduate. Majority of the cases 61(59.2%) were from rural areas. Almost all cases were married. Frequency of QTc interval prolongation was markedly higher among females 38.1% out of total 42, while among males it was found only 27.9% out of total 61.

**Conclusion:** QTc was found to be frequently prolonged in non-ST elevation myocardial infarction and it can be used as a useful diagnostic tool the identification of the high-risk patients with the acute coronary syndrome. **Key words:** MI, QTc, Prolongation, High risk.

#### INTRODUCTION

Non-ST-segment elevation myocardial infarction (NSTEMI) denotes cardiomyocyte death and necrosis by elevated levels of serum troponin.<sup>1</sup> The patients who experience NSTEMI are at a greater likelihood of sudden cardiac death as well as subsequent infarctions.<sup>2</sup> The unstable angina cases and NSTEMI patients carry varying likelihoods of death in addition to recurrent cardiovascular events, in short-term follow-ups and long-term follow-ups.3,4 The existence of various risk groups in patients with the Non-ST elevation-acute coronary syndrome (NSTE-ACS) highlights the necessity of novel tools to achieve early prognostic stratifications and diagnoses.<sup>5</sup> In myocardial ischemia, the contribution of prolonged corrected QT intervals (QTc) has not been fully assessed.<sup>5</sup> An abnormally prolonged QTc intervals have been reported among patients with NSTEMI or unstable angina.6 Various epidemiological research findings that included theoretically healthy people reported that ventricular repolarization disorders in the electrocardiogram (ECG) (not just ST segment deviance, but also variations in T wave morphological features and prolongation of QTc interval) have been linked to a higher risk of unexpected death as well as cardiac death.7,8 Although a prolonged QTc interval has been reported to be a self-determining forecaster of arrhythmic death after acute MI.6,9 However this study has been conducted to assess the frequency of QTc interval prolongation in patients of NSTEMI at tertiary care Hospital facility.

#### MATERIAL AND METHODS

This cross-sectional study was carried out at cardiology

department of Liaquat University of Medical and health sciences. Study was conducted during 6 months from September 2019 to February 2020. All the patients presenting with Non-ST-segment elevation myocardial infarction (NSTEMI), aged above 25 years and either of gender were included in the study. We excluded all the patients with ST elevation myocardial infarction and those not agreeing to take part in this study. Complete clinical examination was done and routine laboratory investigations were done after taking informed consent. All patients underwent the resting ECG. QTc values were computed from lead II. The QTc >440 ms among males and QTc >460 ms among females was considered as prolonged. All the data was recorded via study proforma. For data analysis, SPSS-20 was used.

#### RESULTS

Total 103 patients has been studied, their mean age was  $59.28\pm13.04$  years. Males were 61(59.2%) and females were 42(40.8%). Most of the patients 72(69.9%) were illiterate, followed by 05(04.9%) cases had primary level education, 08(07.8%) were middle passed and 18(17.5%) were graduate. Majority of the cases 61(59.2%) were from rural areas. Almost all cases were married. QTc average was found to be  $416.18\pm10.34$ ms. Table.1

Frequency of QTc interval prolongation was significantly higher among females 38.1% out of total 42, while among males it was found only 27.9% out of total 61. Table.2 Overall average of QTc interval was statistically insignificant according to gender (p-0.590). Fig:1

Variables		Statistics
Age	Mean	59.28 years
	Std. Deviation	13.04 years
	Minimum	30 years
	Maximum	91 years
Gender	Male	61(59.2%)
	Female	42(40.8%)
Educational status	Illiterate	72(69.9%)
	Primary	05(04.9%)
	Secondary	08(07.8%)
	Graduate	18(17.5%)
Residence	Urban	42(40.8%)
	Rural	61(59.2%)
Marital status	Un married	02(1.9%)
	Married	101(98.1%)
QT interval	Mean	416.18ms
	Median	433.00ms
	Std. Deviation	10.34ms

Table 1: Descriptive statistics of demographic characteristics n=103

Table.2 Frequency of QTc interval prolongation according to males and females n=103

Gender	QTc Interval		
	Normal	Prolonged	Total
Male	44(72.1%)	17(27.9%)	61(100%)
Female	26(61.9%)	16(38.1%)	42(100%)

Prolonged in male (>440ms), Prolonged in female (>460ms)



Fig 1: Overall average of QTc interval among males and females  $n{=}103$ 

# DISCUSSION

The Non-ST-segment Elevation Myocardial Infarction (NSTEMI) patients are at greater likelihood of cardiovascular death along with subsequent infarctions.<sup>2</sup> Early diagnosis plays a significant role in reducing such complications.<sup>2</sup> However in this study QTc interval prolongation found to be effective and early diagnostic tool for high risk patients. Similarly Nabati M et al<sup>5</sup> also observed that the prolonged QTc may be utilized as a risk indicator to identify acute coronary syndrome patients who are at greater risk. On the other hand Llois SC et al<sup>10</sup>

demonstrated that in establishing the pathogenesis, a significant and positive correlation between peak troponin T and QTc point towards the correlation between NSTE-ACS prognosis and QTc. Another study of Gadaleta FL et al<sup>9</sup> also observed that In NSTE-ACS patients, prolonged QTc is a self-determinant of cardiovascular risk.

In this study mean age of study subjects was  $59.28\pm13.04$  years and males were in majority 61(59.2%). In comparison to our study, Nabati M et al<sup>5</sup> also found similar findings regarding age and gender by reporting  $58.21\pm10.72$  years of mean age, and 51% of male participants. In the study of Khan R et al<sup>11</sup> reported that out of all cases, males were 64.2% and females were 35.8%, with  $54.3\pm7.6$  years of mean age. Ahmed N et al<sup>12</sup> found that males and females were 64.4% and 35.6% respectively, with  $57.75\pm10.88$  years of mean age.

In this study the frequency of QTc interval prolongation was higher among females 38.1% out of total 42, while among males it was found 27.9% out of total 61.However it is stated that the specific pathophysiology and pathways of sex steroids on QTc interval remain unclear, testosterone seems to lower the QTc intervals among males, whereas estrogen and progesterone interact more complexly among females.<sup>11</sup> Rabkin SW et al<sup>15</sup> also summarized that the link of the female gender and growing age with elevated QTc intervals, highlighting the necessity of having a greater understanding of QTc before agents that prolong the QTc as well as to assess the QTc following the therapy initiation among females and elderly people.<sup>15</sup> An other justification according to previous studies may be that shortened QTc interval, which is more pronounced among males in comparison to females during puberty, may explain the lower prevalence of cardiac events in adult males.<sup>16</sup> In the general population, the QTc has been reported to be sex and age dependent, with smaller value among adult males.<sup>16</sup> These findings are correlated with our findings as in this study mostly males were adult. Another factor of more frequency of prolonged QTc interval among females may be that we have analyzed the results on different cut of values according to gender as QTc value >440 ms among males and QTc value >460 ms among females was considered as prolonged. However this type of analysis not found in almost studies, while only one study discussed that because healthy adult females have QT intervals longer than those in males, the generally accepted cut-off values of normal QTc interval among males and females are 440 ms and 460 ms respectively.17

# CONCLUSION

QTc interval prolongation was found to be frequent among No-ST elevation myocardial infarction and it can used as a useful diagnostic tool to the identification of the high-risk patients with the acute coronary syndrome. However there are many limitations of this study. Therefore further large scale studies are suggested on this subject by taking stratification of its effect modifiers.

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