Evaluation of Mortality Among Patients of Acute Coronary Syndrome with Frontal QRS-T Angle > 100 Presenting to Tertiary Care Hospital

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ABSTRACT

Background: Cardiovascular disease (CVD) alone was responsible for 30% of 58 million deaths world over. ACS includes Unstable angina (UA), non-ST elevation myocardial infarction (NSTEMI) and ST elevation myocardial infection (STEMI). Chest pain often described as heaviness, squeezing sensation or discomfort is most commonly reported symptom in patients with ACS. An increasing trend is seen in burden of ACS in Pakistan population with increasing presentation as STEMI. The diagnosis of ACS is usually made on typical changes on electrocardiogram and on raised in cardiac biomarkers. However, studies are being conducted to determine the outcome predictors in patients with ACS. Indeed, relationship exists between PR and QT intervals, heart rate (HR), QRS duration and P, QRS and T waves axis and cardiovascular outcomes. It is of note that the frontal T axis and spatial QRS T angle also predict mortality. **Objective:** Our objective was to determine the frequency of mortality within 15 days among patients of acute coronary syndrome with frontal QRS-T angle > 100 presenting to tertiary care hospital. **Study Design:** Descriptive case series. **Settings:** Department of cardiology, Jinnah hospital, Lahore. **Duration:** Six months from 19-01-2016 to 19-06-2016. **Methodology:** One hundred eighty (180) patients presenting to ER department with ACS were offered to be enrolled in the study. Informed consent was obtained from all patients and study protocol was explained. Patients were treated according to department protocols. Patients with QRS-T angle >100 was followed for 15 days through regular visits to outdoor departments and telephonic contact. **Results:** A total of 180 patients presenting to emergency department of cardiology, Jinnah hospital, Lahore with acute coronary syndrome were enrolled in the study. The mean age of the subjects was 52.72 ± 16.15 years with minimum and maximum ages of 20 & 80 years respectively. In this study 135 (75%) subjects were male while 45 (25%) were females. Frequency of types of Acute Coronary Syndrome was evaluated and 104 (57.8%) cases were found of ST-segment Elevation MI, 39 (21.7%) were of Non-ST Elevation MI, while 37 (20.6%) were of unstable Angina. The study results showed that among the subjects, 33 (18.3%) were dead within 15 days, 147 (81.7%) survived among the subjects. So, Mortality rate was found 18.3% among the subjects. **Conclusion:** Our study shows that the frequency of mortality seen in patients with QRS - T angles was 18.3%

Keywords: ACS, QRS - T angle, Cardiac mortality.

INTRODUCTION

ACS is most common cause of morbidity and mortality across the world.[1] CVD has been the top most cause of death globally and it is estimated to cause mortality in 17.7 million people representing 31% of global deaths.[2]

ACS encompasses three conditions: 1) NSTEMI, 2) UA, 3) STEMI.[3] Central chest pain which is usually heaviness, tightness, squeezing, burning and dull ache is the most common presenting feature of ACS. ACS burden is on up rise in Pakistani population with STEMI as the leading presentation.[4]

ACS diagnosis is usually based on Electrocardiographic changes and raised cardiac biomarkers Trop T and I.[5,6] However, studies are being conducted to determine the outcome predictors in patients with ACS. There has been reported relation between cardiovascular outcomes and ECG changes (PR and QT intervals, heart rate, QRS duration and P - QRS and T - waves axes).[7] The spatial QRS-T angle and frontal t-axis also predict mortality.[8] Frontal QRS - T angle can

be easily calculated from ECG. There are inconsistent results regarding the mortality in patients with QRS - T angle more than 100. Lown et al showed that the frequency of 2-year mortality seen in patients with ACS has been lowest in patients with frontal QRS - T angles less than 38° and highest in patients with frontal QRS - T angles more than 104° (44.7% vs 14.8%, p <0.001).[9] Aro et al., that QRS - T angle more than 100° have been found in 2.0% of patients, and it is associated with increased risk of sudden cardiac death due to arrhythmia [relative risk (RR) 2.26; 95% confidence interval (CI) 1.59-3.21; P< 0.001).[10] Thus, a wide variation exists between literature with no local study available on this aspect.

This study conducted to determine the frequency of mortality within 15 days among patients of acute coronary syndrome with frontal QRS-T angle > 100 presenting to tertiary care hospital existing literature regarding mortality associates with QRS-T angle > 100 shows this variation ranging from 17.7% to 79.9%. Moreover, no local study is available regarding this aspect thus

this study will bridge this gap and will provide information regarding mortality in patients with QRS-T angle > 100 according to our local population of acute coronary artery syndrome. This will give cardiologist an idea of mortality for better outcome and reduction in mortality and morbidity in these patients. This study will also provide baseline information for further research use of QRS-T angle as outcome predictor and management among patients of coronary artery disease to improve the morbidity and mortality among these patients.

The objective of the study was to determine the frequency of mortality within 15 days among patients of acute coronary syndrome with frontal QRS-T angle > 100 presenting to tertiary care hospital.

METHODOLOGY

Study Design: Descriptive study.

Settings: Department of cardiology, Jinnah hospital, Lahore-Pakistan.

Duration: Six months from 19-01-2016 to 19-06-2016.

Sample Technique: Patients were enrolled using Non-Probability Consecutive sampling.

Sample Size: Estimated sample size was calculated to be 180 at 95% confidence level. 6% margin of error and taking mortality about 17.7% in patients with ACS.

Inclusion Criteria: Both male or female patients of age 20 - 80 years who were new cases of ACS with frontal QRS-T angle more than 100 (as per operational definition) presenting to emergency of tertiary care hospital were enrolled in study while Patients presenting with shock determined by BP<90/60 for more than 30 min, patients with history of pervious ischemic heart disease determine on history of myocardial infarction or echocardiography study showing SWMA (segmental wall motion abnormalities like hypo kinetic wall segments), Patients with coronary artery bypass graft determined on history and medical record, patient with history of infective endocarditic determined by medical record and echocardiography showing vegetation, patients with valvular heart disease determined on echocardiography, patients with chronic kidney disease (creatinine clearance < 15 ml/min).

Exclusion Criteria: Patients presenting after 24 hours from the beginning of symptoms determined by history and patients dying due to cause other than cardiac determined on history and medical records were excluded from the study.

Methods: ACS was defined as any of the following conditions:

ST-Elevation MI (STEMI): Presence of any two of the following will define STEMI.

- ST segment elevation in two consecutive ECG leads (more than 1mm in limb leads or more than 2mm in chest leads,) with one of the following features
- Raised biomarkers (TROPONIN-T positive)
- Cardiac chest pain (central retrosternal chest pain, persisting for more than 20 minutes)

(b) Non-ST-Elevation MI (NSTEMI): Raised biomarkers with cardiac pain or ST segment depression of more than 0.5 mV or symmetrical T - waves inversion in two consecutive ECG leads

(c) Unstable Angina: Recurrent ischemic chest pains (2 or more episode 10 minutes apart) at rest. Along with ST segment depression more than 0.5 mV in two consecutive ECG leads without raised cardiac biomarkers (TROPONIN T positive)

The frontal QRS - T angle was calculated as the difference between QRS and T-axis. A difference of greater than 100 determine on electrocardiography was labeled as frontal QRS - T angle more than 100. Mortality was measured in terms of death within 15 days from presentation in hospital.

After obtaining informed consent from all patients, study protocol was explained. Patients were treated according to department protocols. Patients with QRS-T angle >100 were followed for 15 days through regular visits and data was collected and entered in the SPSS version 20.0. Mean with Standard Deviations were calculated for quantitative variables like age. Frequencies and percentages were calculated in cases of categorical variables like gender, ACS Subtypes and mortality. Data was stratified for age, gender, & ACS Subtype to see the effect of effect modifiers, Poststratification chi square test was applied. P-value ≤ 0.05 is considered significant.

RESULTS

In this present study, a total of 180 patients presenting to emergency department of cardiology, Jinnah hospital, Lahore with ACS were enrolled in the study. The mean age of the subjects was 52.72 ± 16.15 years with minimum and maximum ages of 20 & 80 years respectively. Table 1

In this study 135 (75%) were male while 45 (85%) were females. Table 1

In our study when frequency of types of acute coronary syndrome was evaluated, 104 (57.8%) cases were found of ST-Elevation MI, 39 (21.7%) were of Non-ST Elevation MI, while 37 (20.6%) were of unstable angina. Table 1

The study results showed that among the subjects, 33 (18.3%) were dead within 15 days and 147 (81.7%) survived. Mortality rate was found 18.3% among the subjects. Table 1

Table 1: Descriptive statistics of study population

Parameter	
Age (Mean + SD) years	52.72 + 16.15
Minimum (years)	20
Maximum (years)	80
Gender	
MALE n(5)	135 (75%)
FEMALE	45 (25%)
Types of ACS	
ST elevation MI	104 (57.5%)
Non-ST elevation MI	39(21.7%)
Un-Stable Angina	37(20.6%)
Mortality within 15 days	
Yes	33 (18.3%)
No	147 (81.7%)

Poststratification with respect to age, gender, & Types of ACS was done to deal with effect modifier. Table 2 - 5.

Table 2: Mortality among the subtypes of acute coronary syndrome subtypes

ACS	Mortality Within 15 Days		Total	p-value
	Yes	No		
St-Elevation MI	19	85	104	
Non St-Elevation MI	8	31	39	0.89
Unstable Angina	6	31	37	
Total	33	147	180	

Table 3: Stratification of Mortality among the subtypes of Acute Coronary Syndrome subtypes w.r.t Age categories

Age Categories	Mortality Within 15 Days		Total	p-value
	Yes	No		
20-40 yrs.	7	37	44	
41-60 yrs.	12	56	68	0.031
61-80 yrs.	14	54	68	
Total	33	147	180	

Table 4: Stratification of Mortality among the subtypes of Gender category

Gender	Mortality Within 15 Days		Total	p-value
	Yes	No		
Male	25	110	135	
Female	8	37	45	0.010
Total	33	147	180	

Table 5: Stratification of Mortality among the subtypes of ACS subtypes

ACS	Mortality Within 15 Days		Total	p-value
	Yes	No		
St-Elevation MI	19	85	104	
Non St-Elevation MI	8	31	39	0.023
Unstable Angina	6	31	37	
Total	33	147	180	

DISCUSSION

ACS is a very common cause of morbidity and mortality across the world. CVD alone was responsible for 31% of Global death toll.

The ECG is the most readily accessible and commonly used diagnostic investigation to guide emerging cardiac catastrophes like ACS. The ECG done during an ACS serves as an invaluable investigation of diagnostic, prognostic and therapeutic significance.[11] Previous studies have shown that ECG findings like heart rate, left ventricular mass (voltage, QRS axis),

conduction(Pwave duration, PR interval, QRS duration) and repolarization (ST segment deviation, ST segment slope, QT interval, T wave amplitude) are of prognostic value, patients with hypertension, heart failure, resuscitated patients after cardiac arrest, coronary artery bypass grafting, and in patients in clinical trials.[12-18]

There are multiple tools available to assist in cardiac mortality risk stratification and ECG happens to be available most commonly and cheaply in our setup. It is noninvasive, inexpensive, less human resource utilization and gives quick results. However, it is underutilized in stratification of cardiac mortality risk mainly because of unawareness among medical professionals. During last decade, there has been several studies reported to predict mortality in cardiovascular diseases on electrocardiographic changes.

Our study was a small-scale study with only 180 enrolled patients. In this study, frequency of types of ACS was found to be 104 (57.8%) cases of STEMI, 39 (21.7%) of NSTEMI, while 37 (20.6%) were of UA. The study results showed that among the subjects, 33 (18.3%) were dead within 15 days and 147 (81.7%) survived. So, Mortality rate was found to be 18.3%.

Though very little data is available on the subject, however few studies that we found showed that there is a great inconsistency and variation among the studies. Lown et al showed a 2-year mortality of 44.7% in subjects with ACS having QRS-T angle > 100 however, no short-term mortality data is available which can be compared to our study.[9]

CONCLUSION

It was concluded that the frequency of mortality seen in patients with QRS - T angles >100 was 18.3% in Pakistani population.

LIMITATIONS

No other study on mortality among patients of ACS with frontal QRS-T angle > 100 was found on literature search.

SUGGESTIONS / RECOMMENDATIONS

It is recommended that further large-scale studies should be conducted on this topic which will help us ascertain the prognostic value of this invaluable tool in predicting cardiovascular mortality in ACS.

CONFLICT OF INTEREST / DISCLOSURE

None.

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