



INFARCTION AND ITS CORRELATION WITH SINGLE QUANTITATIVE TROPONIN T AND EJECTION FRACTION < 40%

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KEYWORDS :

AIMS :

To assess the TIMI score for acute STEMI and its relationship with Quantitative Troponin T and LV Ejection Fraction.

OBJECTIVES :

- 1.To assess the relationship between TIMI score for acute STEMI and Single Quantitative Troponin T at 12 hours following admission.
- 2.To assess the relationship between TIMI score for acute STEMI and EF < 40% at 48 hours post admission.

MATERIALS & METHODS

STUDY POPULATION :

New patients admitted with ACS- Acute ST Elevation Myocardial Infarction in the casualty of Sree Balaji Medical College and Hospital, Chennai.

STUDY TYPE :

Cross sectional Study. (Descriptive)

STUDY PERIOD :

Data collection done for a period of 6 months between May 2019 to December 2019.(over a period of 6 months)

PLACE OF STUDY :

Sree Balaji Medical College and Hospital Sample Size : 50

DEFINITION :

We use WHO criteria to define STEMI :

- 1.Evidence of ST elevation in ECG (0.1 mm ST elevation In atleast 2 contiguous leads)
- 2.Ischemic type of chest pain. (central – compressing/ crushing/ burning type of pain with or without radiation to Left or both shoulders/ arms / hands , jaw forehead etc)
- 3.Rise and fall of cardiac markers .Supporting evidence – Echocardiographic evidence of new regional wall motion abnormalities, Q waves in ECG and/or angiographic evidence of vessel obstruction).

(1)is a must with at least 1 of the other criteria with atleast one supporting evidence – chosen by us for convenience of this study.

ENTRY CRITERIA :

(for a patient to be eligible for TIMI score calculation)

- 1.Chest pain for more than 30 minutes.
- 2.ST elevation.
- 3.Symptom onset less than 6 hours.
- 4.Fibrinolytic eligible.

Inclusion Criteria :

All new/fresh patients in the age group > 18 years presenting with acute ST Elevation Myocardial Infarction meeting the

entry definition / entry criteria and getting admitted in Sree Balaji Medical College and hospital.

Exclusion Criteria :

1. Age < 18 years
2. Prior History/ records of ACS .
3. Prior History of PCI/CABG
4. Evolved MI
5. NSTEMI/UA
6. Patients with history /records suggestive of heart failure.
7. Patients with history /records suggestive of CKD
8. Patients with history / records suggestive of or with new evidence of Cardiomyopathies.
9. Severe burns
10. Severe Sepsis
11. Suspected cardiac trauma
12. Suspected aortic dissection
13. Suspected myocarditis/pericarditis
14. Post Cardiac Transplantation.
15. Symptom duration > 6 hours
16. Chest pain < 30 minutes
17. Fibrinolytic ineligible or patients with contraindications to fibrinolysis.
18. Patients who are not willing to participate in the study or from whom we cannot obtain consent.

METHODOLOGY :

1. The data of each patient will be collected in a specific proforma (ANNEXURE 2) which includes patient's name , age, sex, demographic details , presenting complaints, risk factors and all the clinical data.
2. Baseline clinical data will be collected from all patients including proper history- History of Diabetes , Hypertension , angina , Chest pain duration and character, associated symptoms and other necessary history.
3. The collected data of each patient will be collected in a specific proforma (ANNEXURE 1) which includes patient's name , age, sex, demographic details , presenting complaints, risk factors and all the clinical data.
4. The ECG and if necessary a 2D Echocardiogram will be performed for all patients to confirm STEMI.
5. Blood sample will be collected at around 12 hours post admission in all STEMI patients and Troponin T Quantitative levels will be determined by ECLIA (Electro ChemiLuminescent Assay) method and will be entered in the proforma . Fasting Lipid Profile will also be sent and the results entered in a proforma.
6. Reference normal Troponin T is <0.01 ng/mL
7. Repeat 2D Echocardiogram will be done for all patients , 48 hours post admission to determine EF and the value will then be recorded in the proforma.
8. All the relevant data and values are then entered In a masterchart in Microsoft excel Format and then analyzed statistically.

Statistical Analysis

The data was collected in the master chart obtained in the Microsoft excel format.

The collected data was analysed with SPSS 16.0 version. To describe about the data descriptive statistics frequency analysis, percentage analysis were used for categorical variables and the mean & S.D were used for continuous variables. To find the significant difference between the bivariate samples in Independent groups the Mann- Whitney U test was used. To assess the relationship between the variables Spearman's rank Correlation was used. In both the above statistical tools the probability value .05 is considered as significant level.

RESULTS

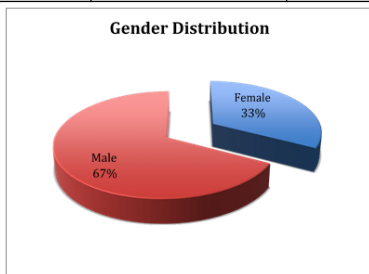
The total patients recruited in our study were 52. The following charts depict frequency distributions.

These are the frequency distributions of various variables used in our study .

Gender Distribution :

In a total of 52 patients enrolled in our study 17 were females and 35 were males and it clearly shows the predominance of males in STEMI.

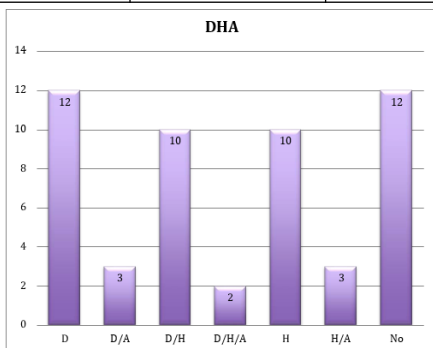
	Frequency	Percent
Female	17	32.7
Male	35	67.3
Total	52	100.0



Distribution Of Diabetes (d) , Hypertension(h) And Angina(α) Patients (Alone And In Combination :

In our study the frequency of diabetes alone was higher together with patients having neither diabetes , hypertension or angina .

	Frequency	Percent
D	12	23.1
D/A	3	5.8
D/H	10	19.2
D/H/A	2	3.8
H	10	19.2
H/A	3	5.8
No	12	23.1
Total	52	100.0

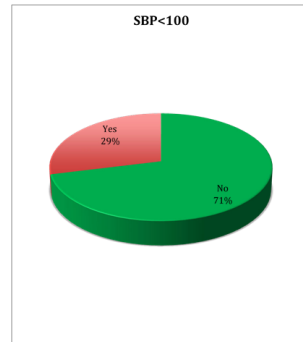


Key : D- Diabetes , H- Hypertension, A- Angina.

Patients With Systolic Bp < 100 Mm Of Hg :

15 patients (28.8%) had a systolic BP of < 100 mm Hg .

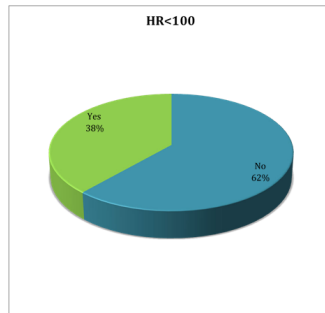
	Frequency	Percent
No	37	71.2
Yes	15	28.8
Total	52	100.0



Patients With Heart Rate < 100 Bpm :

20 patients (38.5%) of patients had a Heart rate of > 100 beats per minute.

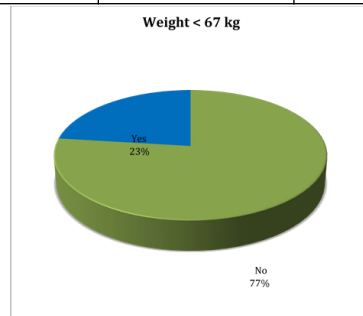
	Frequency	Percent
No	32	61.5
yes	20	38.5
Total	52	100.0



Patients With Weight < 67kg :

12 patients (23.1%) had weight < 67 kg.

	Frequency	Percent
No	40	76.9
Yes	12	23.1
Total	52	100.0



Killip Class 2,3,4 :

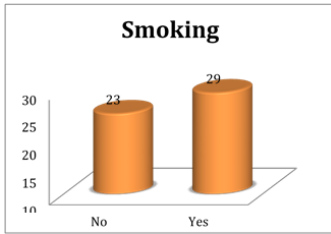
25 patients (48.1%) had a killip score of 2,3 or 4 .

	Frequency	Percent
No	27	51.9
Yes	25	48.1
Total	52	100.0

Patients Who Smoke :

29 patients out of 52 (55.8%) were smokers .

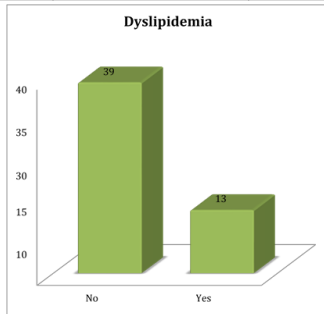
	Frequency	Percent
No	23	44.2
Yes	29	55.8
Total	52	100.0



Patients Who Are Dyslipidemic :

13 patients (25%) in our study were dyslipidemic.

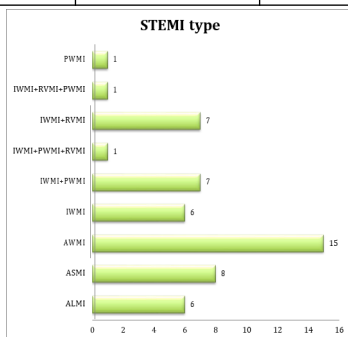
	Frequency	Percent
No	39	75.0
Yes	13	25.0
Total	52	100.0



Stemi Type :

Out of 52 patients 22 patients were found out to be Inferior Wall MI or combinations of IWMI and 15 were found to have Anterior wall MI and only 1 patient had an isolated Posterior Wall MI.

	Frequency	Percent
ALMI	6	11.5
ASMI	8	15.4
AWMI	15	28.8
IWMI	6	11.5
IWMI + PWMI	7	13.5
IWMI + PWMI + RVMI	1	1.9
IWMI + RVMI	7	13.5
IWMI + RVMI + PWMI	1	1.9
PWMI	1	1.9
Total	52	100.0

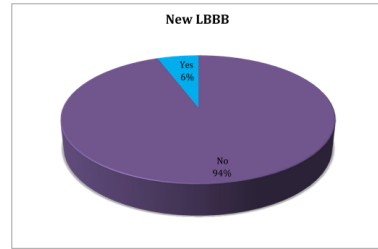


KEY : PWMI- Posterior wall Myocardial Infarction RVMI- Right Ventricular Myocardial Infarction IWMI- Inferior Wall Myocardial Infarction AWMI- AnteroLateral Myocardial Infarction ALMI- AnteroSeptal Myocardial Infarction STEMI- ST Elevation Myocardial Infarction

Patients With New LBBB :

Only 3 patients in our study had a new onset LBBB (Left Bundle Branch Block) in ECG.

	Frequency	Percent
No	49	94.2
Yes	3	5.8
Total	52	100.0



Patients With Time To Treat > 4 Hours

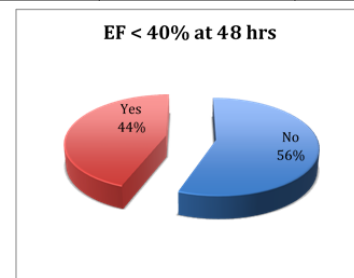
In our study all the enrolled patients were treated with thrombolysis before 4 hours .

	Frequency	Percent
No	52	100.0

Patients With Ejection Fraction < 40% :

23 patients (44.2%) in our study had an EF of < 40%.

	Frequency	Percent
No	29	55.8
Yes	23	44.2
Total	52	100.0

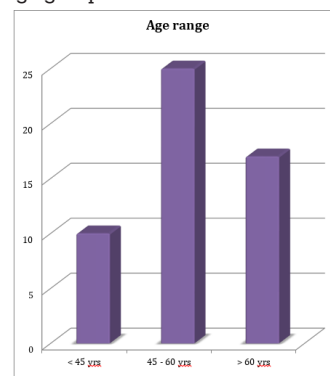


AGE RANGE :

The age range in our study is depicted in the following table and bar diagram.

	Frequency	Percent
< 45 yrs	10	19.2
45 - 60 yrs	25	48.1
> 60 yrs	17	32.7
Total	52	100.0

It can be noted that the maximum events in our study occurred in the 45- 60 age group .



Age range – Note that the maximum number of events occurred in the 45- 60 age group in our study (NB:This may be biased as we take into account only the number of patients reaching the hospital . It does not take into account the patients who do not report after an MI or patients who die before reaching the hospital)

Thrombolysis In Myocardial Infarction Score :

	Frequency	Percent
0	6	11.5
1	6	11.5
2	7	13.5

3	3	5.8
4	9	17.3
5	2	3.8
6	7	13.5
7	2	3.8
8	2	3.8
9	6	11.5
10	2	3.8
Total	52	100.0

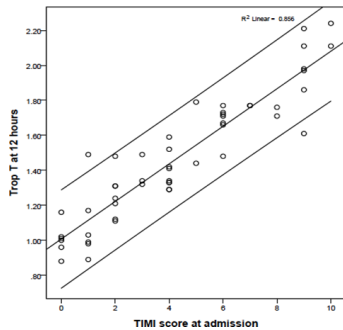
Statistical Analysis :

The total patients enrolled in our study were 52 . The maximum age is 76 and the minimum is 36. In the male patients maximum age recorded was 71 and the minimum age was 36 where as in the females it is 76 and 42 respectively.

Correlation Of Timi Score At The Time Of Admission And Single Quantitative Troponin T At 12 Hours :

TIMI score for acute STEMI which was calculated at the time of admission was correlated with Single Quantitative Troponin T at 12 hours using non parametric correlations using correlation coefficient . It was then statistically tested using spearman's rho (sig two tailed) and the correlation is taken to be significant at a p value of 0.05.

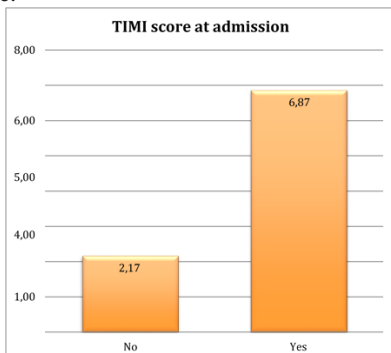
In our study the correlation between TIMI score for acute STEMI at the time of admission and with Single Quantitative Troponin T at 12 hours was found to be highly significant at p=0.005.



From the graph , it was evident at that the correlation between TIMI score at the time of admission and TIMI score at 48 hours is statistically significant.

Association Between Timi Score At The Time Of Admission And Ejection Fraction </> 40 % At 48 Hours :

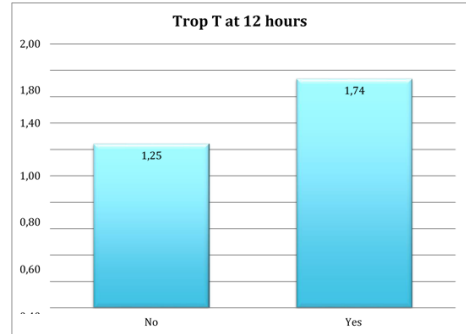
The association between TIMI score at the time of admission and EF < 40 % was tested using Mann – Whitney U test. Those with EF > 40% at 48 hours had a mean TIMI score of 2.17 during admission and those with EF <40% at 48 hours had a mean TIMI score of 6.87 during admission . 23 patients had a EF of < 40% at 48 hours and 29 patients had a EF >40% at 48 hours. The association was found to be statistically significant at p=0.005.



Association Between Troponin T At 12 Hours And Ejection Fraction </> 40% At 48 Hours :

The association between Troponin T at 12 hours and Ejection

fraction < 40 or >40% was tested again using Mann Whitney U test. Those with Ejection fraction <40% at 48 hours had a mean Troponin T of 1.74 ng/mL at 12 hours and those with EF > 40% at 48 hours had a mean Troponin T level of 1.25 at 12 hours. The association was found to be statistically significant at p=0.005.



The association between all three variables is depicted in the chart below.

Mean TIMI score at EF <40% admission

No	2.17
Yes	6.87

Mean Trop T at 12 hours

No	1.25
Yes	1.74

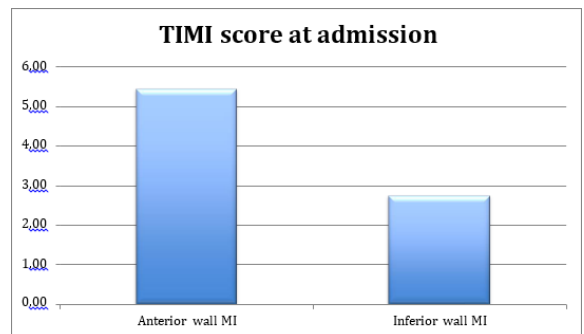
All the aforementioned statistics confirms that the correlation between

1. TIMI score at the time of admission and Troponin T at 12 hours
2. The association between Troponin T at 12 hours and EF <40% at 48 hours
3. The association between TIMI score at the time of admission and EF <40% at 48 hours.

These are also found to be highly significant statistically at p=0.005. Further Statistical data were obtained to confirm the results and exclude the possible confounders like smoking and dyslipidemia .

Correlation Between TIMI Score At The Time Of Admission And The Type Of MI :

The TIMI score at the time of admission was correlated with the type of MI . First MI was classified into two types- those involving anterior wall (AWMI, ASMI, ALMI) and those involving Inferior wall (IWMI, IWMI+RVMI, IWMI+ RVMI+ PWMI, IWMI+PWMI, isolated PWMI). This analysis was actually done to find out the correlation as well as VALIDATE THE TIMI SCORE with its variables as one of the variable is the presence of AWMI. The mean TIMI score for 5.45 for AWMI's and 2.74 for IWMI's at the time of admission. The results were tested using Mann Whitney U test and was found to be statistically significant at p=0.001.

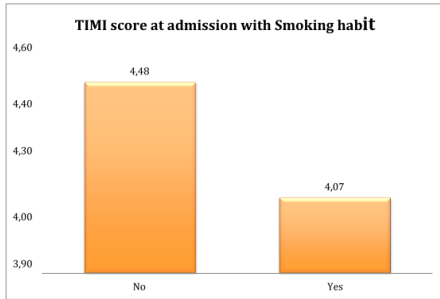


And also since points awarded for AWMI was only 1 in the TIMI

score, the difference in our study was actually around 2.71. This maybe due to the fact that AMI is usually severe with involvement of other variables like SBP, HR and Killip class used in the TIMI score. That might need a separate Study and further evaluation.

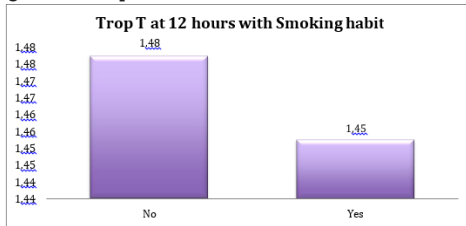
TIMI Score And Its Association With Smoking :

This was done actually to find out smoking as a potential confounder in altering one or more components of the TIMI score. In our study 29 were smokers and 23 were non smokers out of a total of 52 patients. The mean TIMI score in Smokers were found to be 4.07 and mean TIMI score in non smokers were found to be 4.48 and the results are tested with Mann Whitney U test and are found to be Statistically NOT significant at p=0.774.



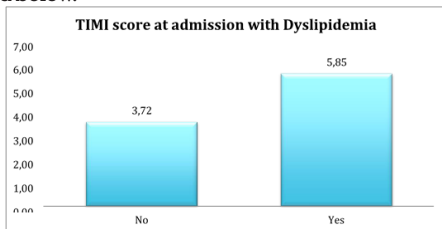
Troponin T And Its Association With Smoking :

This was done actually to find out smoking as a potential confounder in altering the Troponin T values considerably. It was found that the smokers had a mean Troponin T value of 1.45 ng/mL at 12 hours and non smokers had a mean troponin T value of 1.48 ng/mL at 12 hours and the results were tested using mann Whitney U test and it is found to be statistically NOT significant at p=0.956.



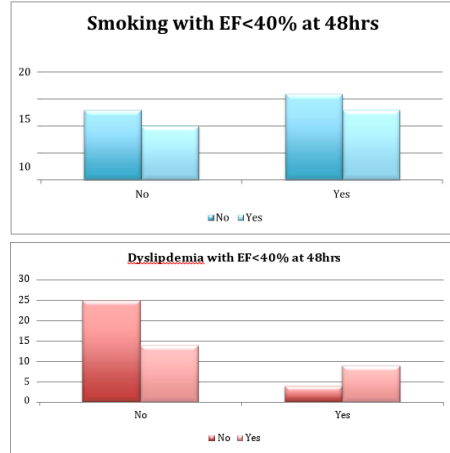
Association Of Dyslipidemia With TIMI Score At Admission And Troponin T at 12 hours :

This was also done to find out whether dyslipidemia affects TIMI score and Troponin T. It is found out that patients with dyslipidemia had a mean TIMI score of 5.85 at the time of admission at p=0.048 and a mean Troponin T value of 1.59 ng/mL at 12 hours at p=0.131 and both were statistically not significant as p>0.01 was considered to be statistically insignificant. Patients without dyslipidemia had a mean TIMI score of 3.72 at the time of admission at p=0.048 and a mean Troponin T value of 1.42ng/mL at 48 hours at p=0.131. Both were tested using Mann Whitney U test. The results were depicted below.



Association Of EF <40% With Smoking And Dyslipidemia :

The association of Smoking and dyslipidemia with EF<40% were tested individually using Chi square tests and the association was found to be statistically not significant at p=0.922 (for smoking and EF>40%) and p=0.036 (for dyslipidemia and F<40%).



DISCUSSION

Acute Coronary Syndrome is a spectrum of disorders which include ST Elevation Myocardial Infarction (STEMI), Non ST Elevation Myocardial Infarction(NSTEMI) and Unstable Angina (UA). STEMI is usually associated with significant short term as well as long term mortality. STEMI is diagnosed by characteristic ECG changes along with clinical features and elevation of cardiac biomarkers.¹

There are a lot of prognostic markers available for ST Elevation Myocardial Infarction. But the Thrombolysis In Myocardial Infarction (TIMI) score is clinical and was widely known to predict prognosis in the form of mortality at 30 days. TIMI score³ uses simple clinical data, and its calculation is simple and entirely bedside and it can be assessed through simple clinical examination and history⁴

The Troponin T which is used as a biomarker for diagnosing STEMI, can also be used as a prognostic marker based on the value of Troponin T at various points post MI¹³. Usually the levels of Troponin T at 12, 24, 48 or 72 hours can be taken to predict the prognosis. Troponin T is released from the cardiac myocytes upon death/lysis usually during infarction). So the absolute Troponin T levels can predict the size of the infarct in MI and especially STEMI. The infarct size is a well known predictor of severity and it is directly proportional to the mortality and morbidity and hence widely used as a prognostic marker.

The Ejection fraction³² has long been recognized as a prognostic indicator. Roughly an Ejection fraction of <40% has been shown by a number of studies as an indicator of poor prognosis and increased long term and short term mortality and morbidity. Even though its usefulness has been questioned in recent times, it is still regarded as an important prognostic variable. There are numerous other prognostic variables but in our study we use only TIMI score³⁰, Troponin T and Ejection fraction <40%. Since TIMI score is entirely clinical we evaluated the associations between these three variables so that we can predict the other two using TIMI score itself which is calculated at the time of admission. There were no previous studies made in regard to this association.

Total of 52 patients were enrolled in our study over a period of 6 months and 17 were females and 35 were males. We obtained a standard questionnaire mentioning all the data and variables used in the TIMI score as well as ejection fraction <40% obtained at 48 hours and Quantitative Troponin T obtained at 12 hours. We considered smoking and dyslipidemia as potential confounders and hence added to the list. **The collected data was analysed with SPSS 16.0 version** In our study the frequency of diabetes alone was higher together with patients having neither diabetes, hypertension or angina, 15 patients (28.8%) had a systolic BP

of < 100 mm Hg, 20 patients (38.5%) of patients had a Heart rate of > 100 beats per minute, 12 patients (23.1%) had weight < 67 kg, 25 patients (48.1%) had a killip score of 2,3 or 4, 29 patients out of 52 (55.8%) were smokers , 13 patients (25%) in our study were dyslipidemic , 22 patients were found out to be Inferior Wall MI or combinations of IWMI and 15 were found to have Anterior wall MI and only 1 patient had an isolated Posterior Wall MI, Only 3 patients in our study had a new onset LBBB (Left Bundle Branch Block) in ECG. In our study all the enrolled patients were treated with thrombolysis before 4 hours .

23 patients (44.2%) in our study had an EF of < 40%. The maximum age is 76 and the minimum is 36. In the male patients maximum age recorded was 71 and the minimum age was 36 where as in the females it is 76 and 42 respectively. The correlation and association was done between all possible variables . Correlation was done between TIMI score at the time of admission and Single Quantitative Troponin T at 12 hours. In our study the correlation between TIMI score for acute STEMI at the time of admission and with Single Quantitative Troponin T at 12 hours was found to be highly significant at $p=0.005$. Association between TIMI score and $EF < 40\%$ at 48 hours was tested and the association was found to be statistically significant at $p=0.005$. Those with $EF > 40\%$ at 48 hours had a mean TIMI score of 2.17 during admission and those with $EF < 40\%$ at 48 hours had a mean TIMI score of 6.87 during admission . 23 patients had a $EF < 40\%$ at 48 hours and 29 patients had a $EF > 40\%$ at 48 hours. The association between Troponin T at 12 hours and $EF < 40\%$ at 48 hours was then tested and the association was found to be statistically significant at $p=0.005$. "Those with Ejection fraction $< 40\%$ at 48 hours had a mean Troponin T of 1.74 ng/mL at 12 hours and those with $EF > 40\%$ at 48 hours had a mean Troponin T level of 1.74 at 12 hours." 55

The TIMI score at the time of admission was then correlated with the type of MI. The mean TIMI score is 5.45 for AWTMI's and 2.74 for IWMI's at the time of admission. The results were found to be statistically significant at $p=0.001$.

The association between potential confounders – smoking and dyslipidemia was then done. The mean TIMI score in Smokers were found to be 4.07 and mean TIMI score in non smokers were found to be 4.48 and the results were found to be Statistically NOT significant at $p=0.774$. The association between Smoking and Troponin T was then done. It was found that the smokers had a mean Troponin T value of 1.45ng/mL at 12 hours and non smokers had a mean troponin T value of 1.48 ng/mL at 12 hours and the results were tested using mann Whitney U test and it is found to be statistically NOT significant at $p=0.956$.

The association between TIMI score and dyslipidemia was then done. It is found out that patients with dyslipidemia had a mean TIMI score of 5.85 at the time of admission at $p=0.048$ and a mean Troponin T value of 1.59 ng/mL at 12 hours at $p=0.131$ and both were statistically not significant as $p > 0.01$ was considered to be statistically insignificant. Patients without dyslipidemia had a mean TIMI score of 3.72 at the time of admission at $p=0.048$ and a mean Troponin T value of 1.42ng/mL at 48 hours at $p=0.131$

Lastly , the association of $EF < 40\%$ with smoking and dyslipidemia was sought for. The association of Smoking and dyslipidemia with $EF < 40\%$ were tested individually using Chi square tests and the association was found to be statistically not significant at $p=0.922$ (for smoking and $EF > 40\%$) and at $p=0.036$ (for dydlipidemia and $F < 40\%$).

Since our study is totally new (TIMI score have not been compared with Troponin T or Ejection fraction) and have not

been performed in the past , we did not find any control studies to compare our study with their experiences. We consider this as a potential disadvantage of our study and so this study might need further studies to confirm positive and negative associations found in our study. We believe that will happen in the near future.

CONCLUSION

1. TIMI score calculated at the time of admission has significant correlation with Single Quantitative Troponin T at 12 hours post admission. ($p=0.005$)
2. TIMI score calculated at the time of admission also has significant association with Ejection Fraction < 40% at 48 hours post admission . ($p=0.005$)
3. Single Quantitative Troponin T obtained 12 hours post admission has significant association with Ejection Fraction < 40% at 48 hours post admission ($p=0.005$)
4. There is no statistically significant association between smoking and TIMI score at admission , Troponin T at 12 hours or Ejection Fraction < 40% at 48 hours.
5. There is no statistically significant association between dyslipidemia and TIMI score , Troponin T at 12 hours or Ejection Fraction < 40% at 48 hours.

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