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Relation of Absolute Eosinophil Count in Patients with Acute Coronary Syndrome

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Abstract
Acute coronary syndrome is the most common cause of cardiovascular disease leading to death. The main cause is due to atherosclerosis of coronary arteries leading to thrombus formation and obstruction causing myocardial infarction. There are various factors which promote thrombus formation. Among the various factors, eosinophils also play an important role in thrombus formation. So this study was done to assess the relation of absolute eosinohil count in acute coronary syndrome
A total of 100 cases presenting with acute coronary syndrome was taken for the study.
Smokers, alcoholic and patients with stool/ova cyst positive were excluded from this study
According to the study done in these patients, patients with increased eosinophil count presented with killips class4 and showed decreased ejection fraction.
Therefore, increased eosinophil count can be associated with increased propensity to thrombus formation and leading to acute coronary syndrome with increased severity.
Keywords: *Acute coronary syndrome, Absolute eosinophil count, Killips class, CK-MB, Trop –I.*

Introduction

Ischemic heart disease and cerebrovascular disease are the most common cause of mortality and morbidity worldwide. Over three quarters of death and 85 % of disability from cardiovascular disease occurs in developing countries. The huge burden of cardiovascular disease in Indian sub-continent is due to the huge population and high incidence of prevalence of cardiovascular risk factors. Cardiovascular diseases also manifests 10 years earlier than the rest of the world in the Indian population.

The incidence of myocardial infarction in India is 64.37/1000 people among men aged between 29-69 years of age. In the recent years India has seen a huge transition in its disease burden pattern. The load of communicable and non communicable disease is expected to be reversed by 2020.India is on the threshold of an epidemic of cardiovascular disease. A recent concern is that the incidence of CVD has one up significantly for people in the age group 25 – 69 years, which means losing more productive people to the disease. Urban India has higher prevalence than rural India.

Myocardial infarction occurs when there is an abrupt reduction in coronary blood flow usually occurring as a result of thrombotic occlusion of the coronary artery already been narrowed by the formation of atherosclerotic plaques which fissures, ruptures or ulcerates and under favourable conditions thrombogenesis may take place.[1,2] A mural thrombus forms at the site of plaque rupture and leads to coronary artery occlusion. An initial platelet monolayer forms at the site of the plaque rupture, a series of agonists (collagen, ADP, epinephrine, serotonin) released may promote platelet activation. Following stimulation by agonists, thromboxane A2 is produced and released. This may further activate platelets and hence aggravating thrombogenesis.[12,13] Eosinophilsplay an unexpected role during plasmatic coagulation, hemostasis, and thrombosis.

Eosinophil cationic protein plays a major role in thrombotic events in humans.[14,15] Eosinophils contributed to intravascular thrombosis by exhibiting a strong endogenous thrombin-generation capacity that relied on the enzymatic generation and active provision of a procoagulant phospholipid surface enriched in 12/15-lipoxygenase–derived hydroxyl-eicosa- tetraenoic acid–phosphatidylethanolamines which promote platelet aggregation eosinophils and enzymatic lipid oxidation are regulatory elements that facilitate both hemostasis and thrombosis in response to vascular injury, thus promoting thrombus formation.[7,8] This study therefore aims to show the relation of Absolute Eosinophil count in MI.

Methodology

This study was conducted at Rajah Muthiah Medical College and Hospital, Chidambaram during the period between November 2017and April 2019.100 patients who were admitted with acute coronary syndrome (STEMI/NSTEMI) were included in the study. Patients who were smoker, alcoholic, stool ova/cyst positive were excluded from the study. Clinical examination, Killip's class, Cardiac Enzymes like CKMB, Trop-I, Absolute eosinophil count, Total count, ECG and echo were done.

Data Analysis and Result

A total 100 people were included in the final analysis.

Table 1: Descriptive analysis of age in study population (N=100)

Parameter	Mean ± SD	Median	Min	Max	95% C.I	
					Lower	Upper
Age	61.01 ± 14.24	60.00	34.00	95.00	58.18	63.84

Table 2: Descriptive analysis of age group in study population (N=100)

Age group	Frequency	Percentage
<46	15	15.0%
46 to 65	52	52%
66 to 85	28	28%
>85	5	5%
Total	100	100%

Figure 1: Bar chart of age group distribution in study population (N=100)
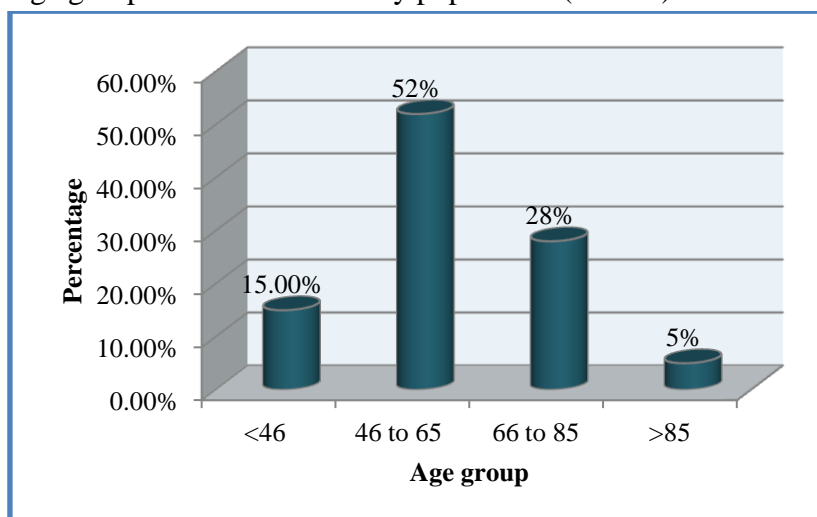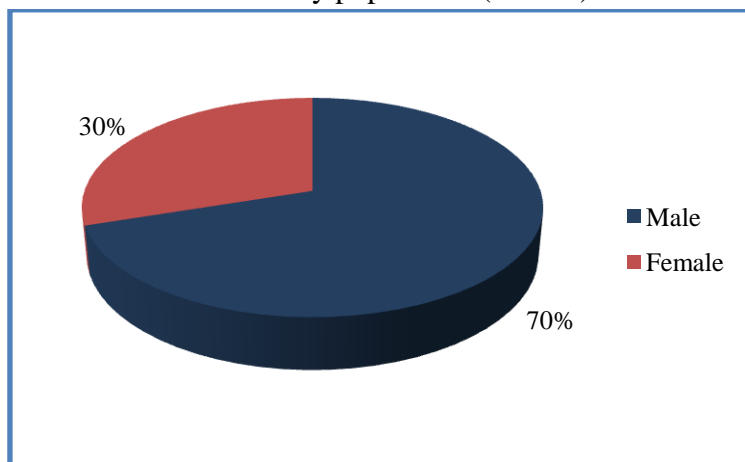

In this study, highest incidence was noted in the age group of 46 to 65 years (52%).

Table 3: Descriptive analysis of gender in study population (N=100)

Gender	Frequency	Percentage
Male	70	70%
Female	30	30%
Total	99	100%

**Figure 2:** Pie chart of gender distribution in study population (N=100)

In this study males are more commonly affected than females (70%).

Table 4: Descriptive analysis of diagnosis in study population (N=100)

Diagnosis	Frequency	Percentage
AWMI	30	30%
ALWMI	10	10%
IWMI	41	41%
NSTEMI	16	16%
PWMI	1	1%
SEPTAL MI	2	2%
Total	100	100%

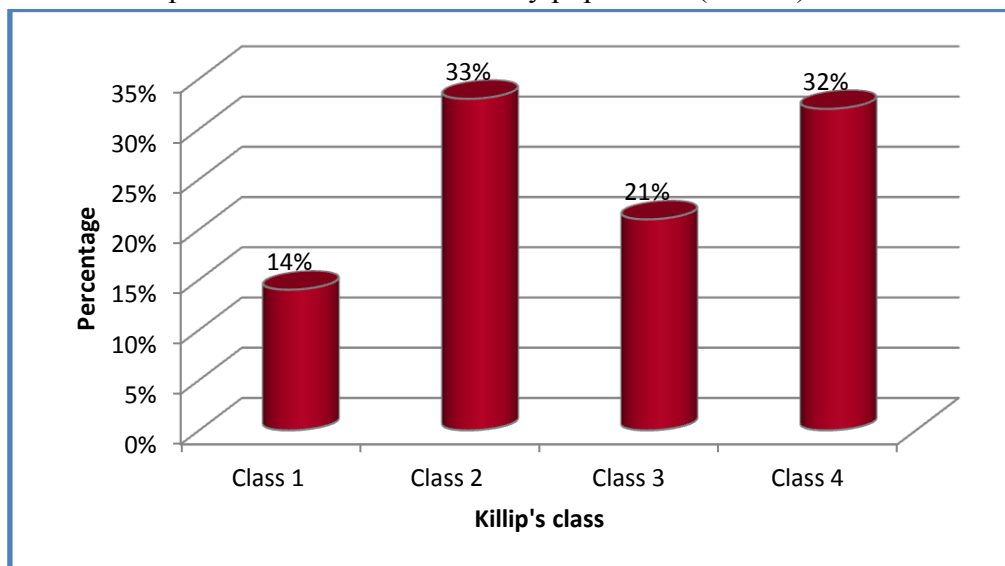**Figure 3:** Bar chart of diagnosis distribution in study population (N=100)
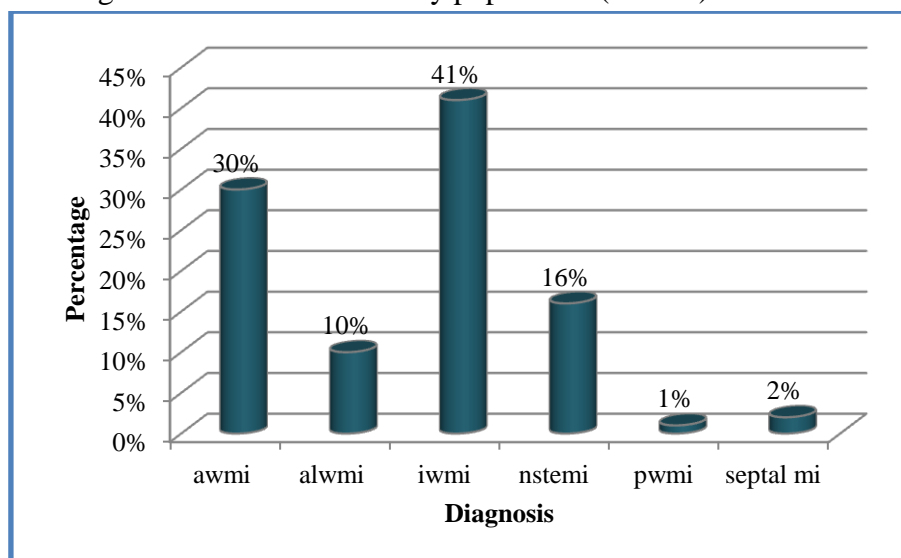
In this study 41% cases were Inferior wall mi.

Table 5: Descriptive analysis of Killip's class in study population (N=100)

Killip's class	Frequency	Percentage
Class 1	14	14%
Class 2	33	33%
Class 3	21	21%
Class 4	32	32%
Total	100	100%

**Figure 4:** Bar chart of Killip's class distribution in study population (N=100)

In this study, 33% cases presented with Killip's class 2 followed by 32% cases presented Killip's class 4.

Table 6: Descriptive analysis of Troponin I in study population (N=100)

| Troponin I	Frequency	Percentage
Negative	62	62%
Positive	38	38%
Total	100	100%

Figure 5: Pie chart of Troponin I distribution in study population (N=100)
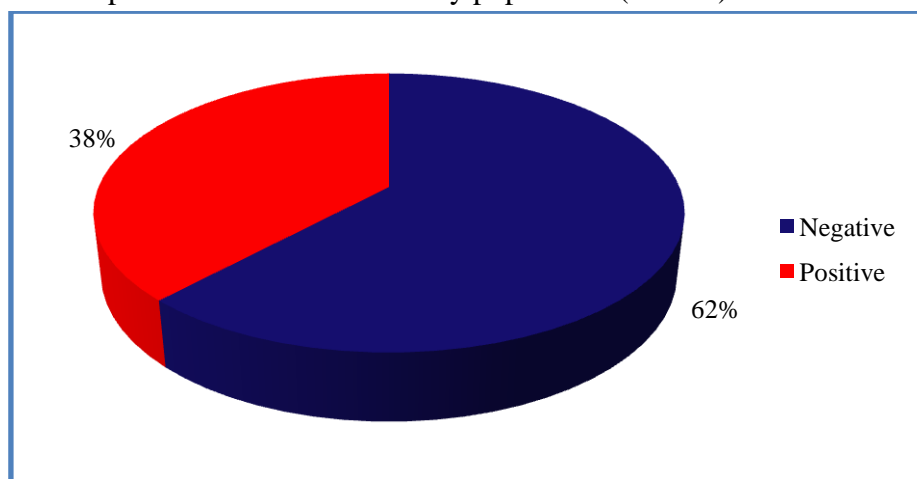
Table 7: Descriptive analysis of Absolute eosinophil count in study population (N=100)

Absolute eosinophil count	Frequency	Percentage
Not affected (≤500)	79	79%
Affected (> 500)	21	21%
Total	100	100%

**Figure 6:** Pie chart of Absolute eosinophil count distribution in study population (N=100)
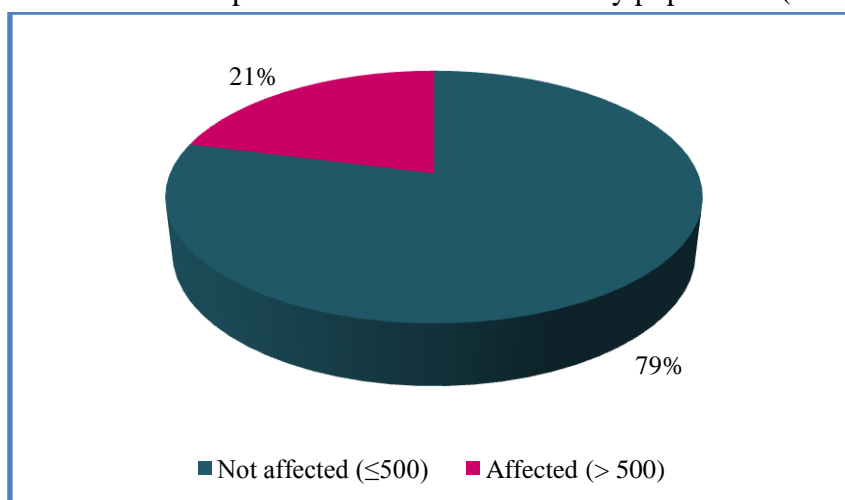
In this study21% cases showed an absolute eosinophil count of (>500 cells/cumm)

Table 8: Comparison of Killip's class with Absolute eosinophil count (N=100)

Killip's class	Absolute eosinophil count		Total
	Not affected	Affected	
Class 1	13	1	14
Percentage	16.5%	4.8%	14%
Class 2	30	3	33
Percentage	38%	14.3%	33%
Class 3	17	4	21
Percentage	21.5%	19%	21%
Class 4	19	13	32
Percentage	24.1%	61.9%	32%
Total	79	21	100
Chi square	11.919		
P value	0.008		

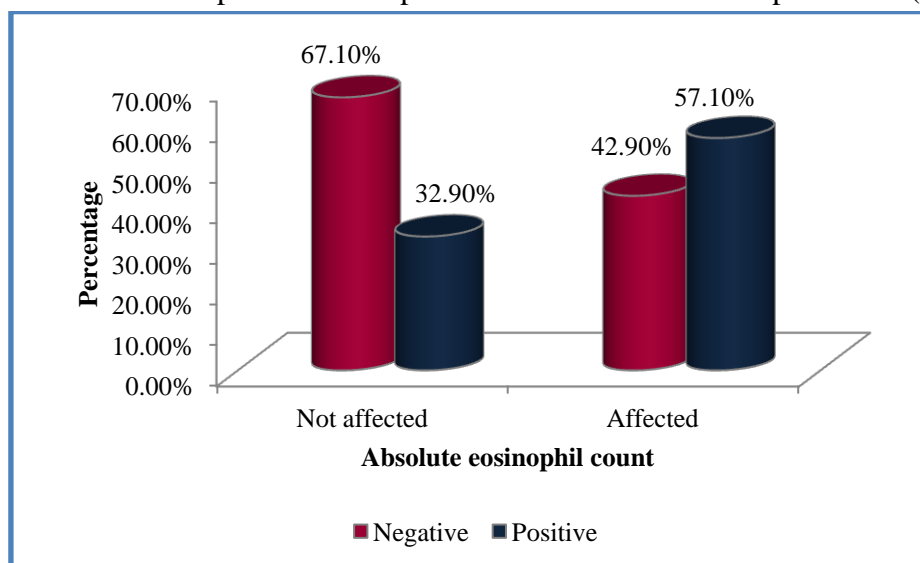**Figure 7:** Cluster bar chart of comparison of Killip's class with Absolute eosinophil count (N=100)
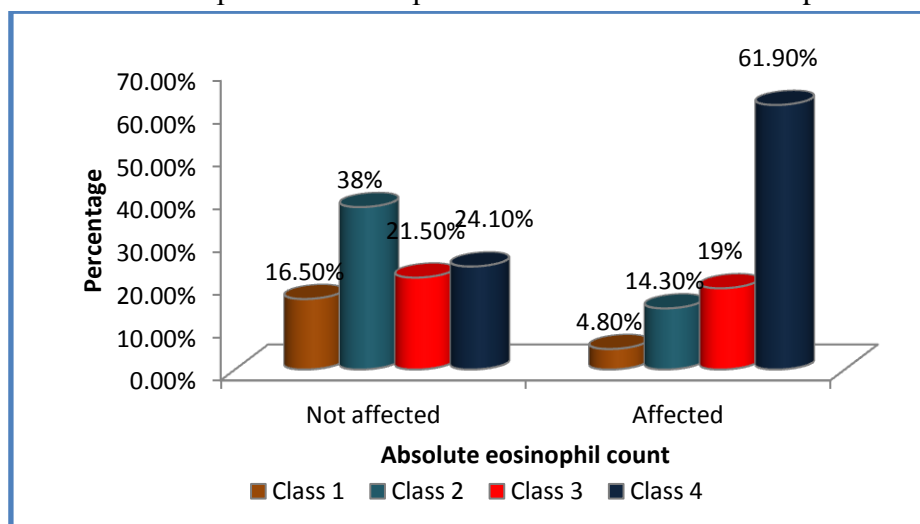
By conventional criteria the relationship between Absolute eosinophil count and Killp's class is considered to be statistically significant since p value is <0.05. This means as Absolute eosinophil count increases, Killip's class also increases.

Table 9: Comparison of Troponin I with Absolute eosinophil count (N=100)

Troponin I	Absolute eosinophil count		Total
	Not affected	Affected	
Negative	53	9	62
Percentage	67.1%	42.9%	62%
Positive	26	12	38
Percentage	32.9%	57.1%	38 %
Total	78	21	100
Chi square	4.135		
P value	0.042		

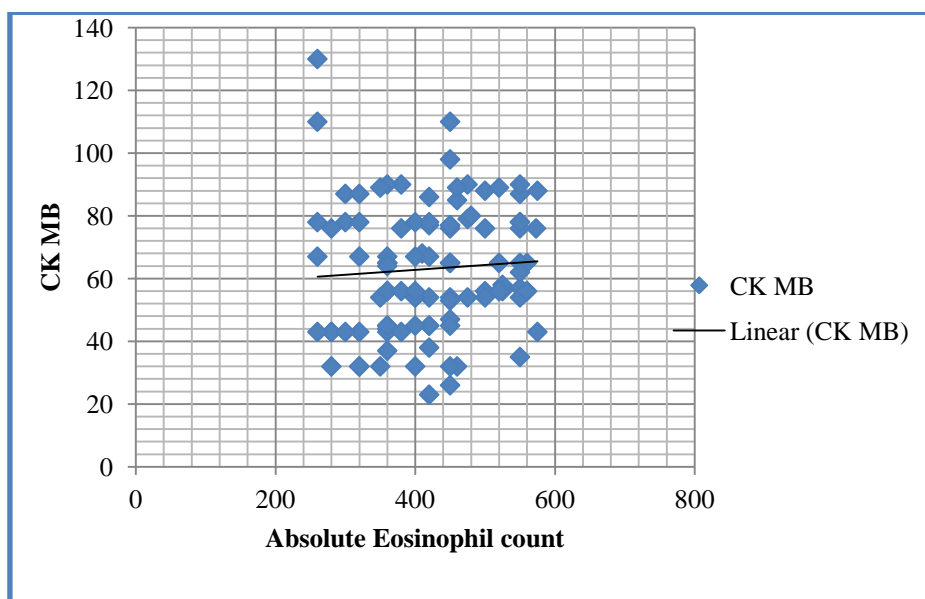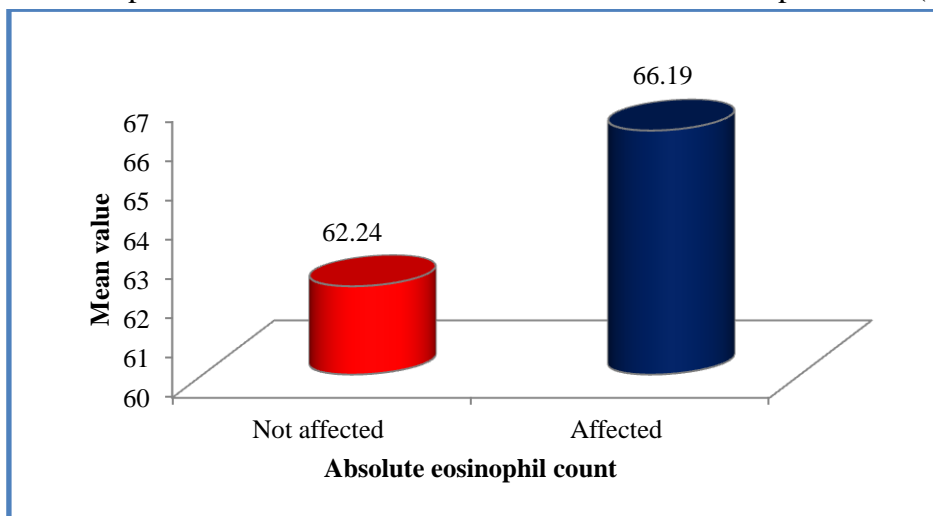**Figure 8:** Cluster bar chart of comparison of Troponin I with Absolute eosinophil count (N=100)

By conventional criteria the relationship between Absolute eosinophil count and trop I is considered to be statically significant since p is <0.05. This Means as Absolute eosinophil count increases, Trop I also showed positive in our study subjects.

Table 10: Comparison of Mean CK MB between Absolute eosinophil count (N=100)

Parameter	Absolute eosinophil count		P value
	Not affected (N=79)	Affected (N=21)	
CK MB	62.24 ± 21.72	66.19 ± 15.36	0.436

Figure 9: Bar chart of comparison of Mean CK MB between Absolute eosinophil count (N=100)

By conventional criteria, the relationship between Absolute eosinophil count and CKMB is statically significant (p value<0.05). This means as Absolute eosinophil count increases, CKMB value also increases in linear fashion.

Table 11: Comparison of Mean Ejection fraction between Absolute eosinophil count (N=100)

Parameter	Absolute eosinophil count		P value
	Not affected (N=79)	Affected (N=21)	
Ejection fraction	46.61 ± 4.25	44 ± 5.79	0.023

Figure 10: Bar chart of comparison of Mean Ejection fraction between Absolute eosinophil count (N=100)
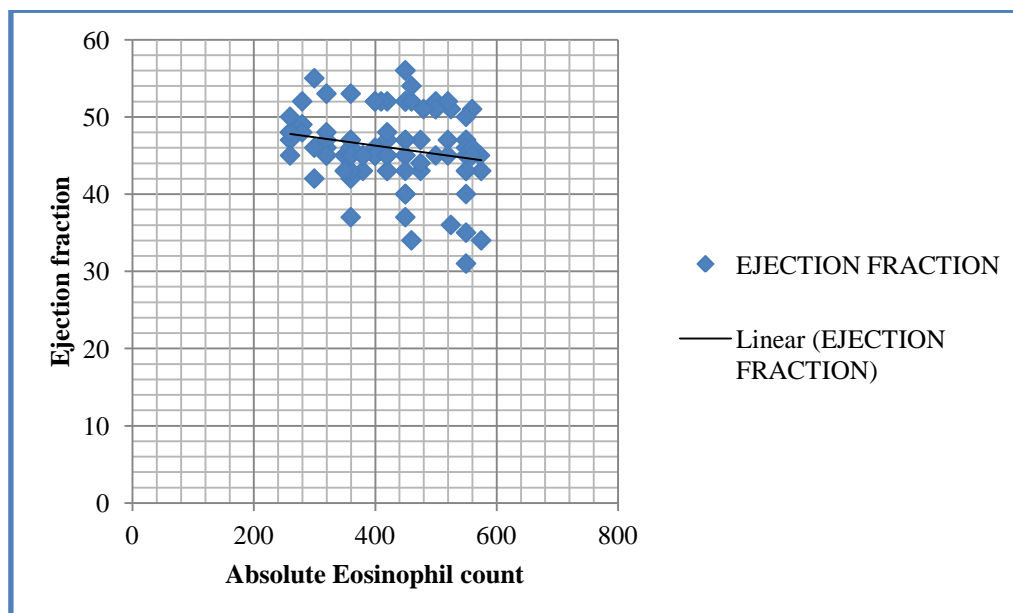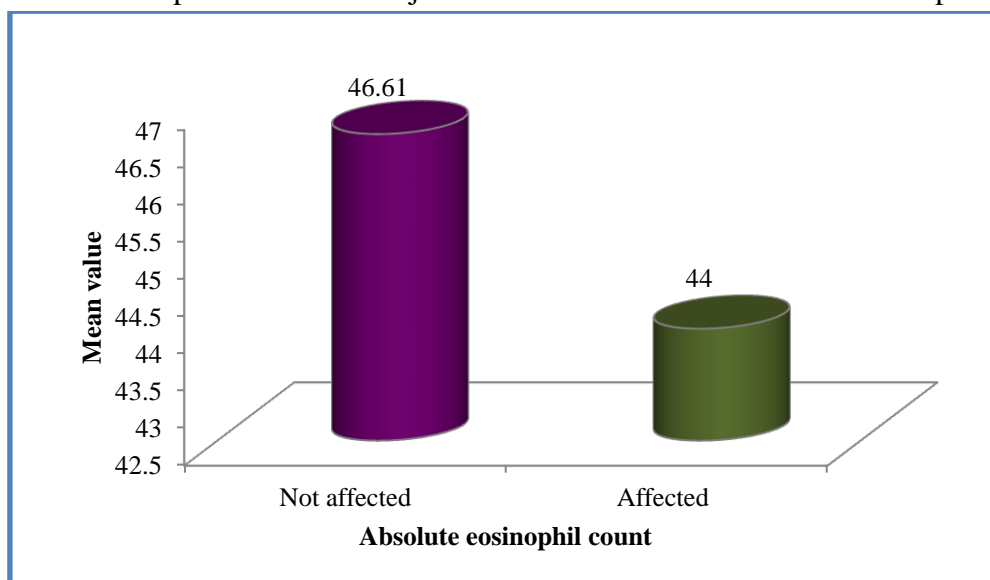
By conventional criteria the relationship between absolute eosinophil count and ejection fraction is considered to be stastically significant since $p < 0.05$. This means as Absolute eosinophil count increases, ejection fraction decreases in linear fashion.
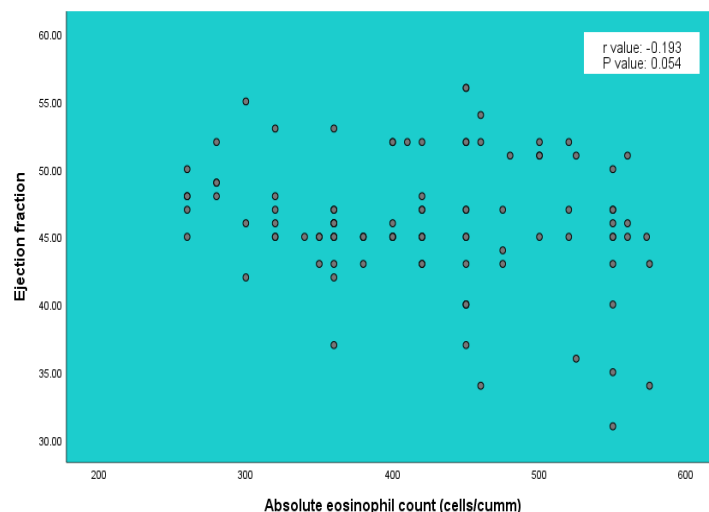
Table 12: Correlation between Absolute eosinophil count and Ejection fraction (N=100)

Parameter	Pearson correlation	P value
Ejection fraction	-0.193	0.054

There was a weak negative correlation between Absolute eosinophil count and Ejection fraction score(r value: -0.193, P value: 0.054).

Figure 11: Scatter diagram of correlation between Absolute eosinophil count and Ejection fraction (N=100)

Table 13: Correlation between Absolute eosinophil count and CK MB (N=100)

Parameter	Pearson correlation	P value
CK MB	0.070	0.491

There was a weak positive correlation between Absolute eosinophil count and CK MB score (r value: 0.070, P value: 0.491)

Figure 12: Scatter diagram of correlation between Absolute eosinophil count and CK MB (N=100)
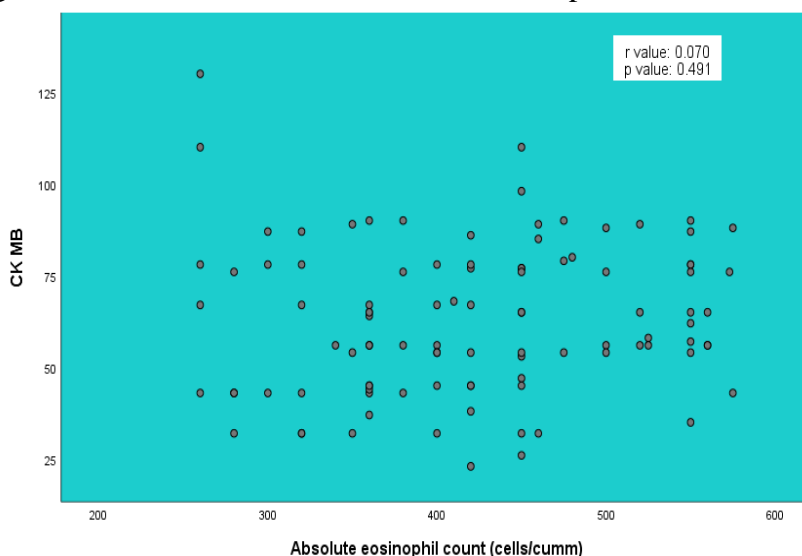
Discussion

The present study included 100 cases of acute coronary syndrome in whom absolute eosinophil count, cardiac enzymes, ECG, Echo was done. Of these 100 cases 21 cases had elevated eosinophil count (<500 cells/cumm), remaining cases had eosinophil count below 500.CKMB was elevated in cases with absolute eosinophil count above 500 and trop I was positive in those cases and they too had decreased ejection fraction.

Age

Studies (Nayak et al, Lipska et al) performed on acute coronary syndrome showed common age group was above 45 years. In our study the common age group was 46 to 65 years.

Gender

Studies (Nayak et al, Lipska et al) performed on acute coronary syndrome showed male preponderance. In our study majority of cases were males.

Type of myocardial infarction

Studies Caroli et al, Varona et al showed anterior wall mi common among Indian population. But in our study majority of the cases were inferior wall MI.[5,6]

Systemic hypertension

Studies (Mehendirdatta mm et al), hypertension has been significantly associated with MI, in our study 92 cases were found to be hypertensive.[1,2]

Type 2 diabetes mellitus

Studies (journal of diabetic research) Vol 2018, incidence of mi increased within five years of diagnosis of type 2 diabetes. In our study 64 cases were found to be type 2 diabetes.

Creatinine kinase –MB (CK-MB)

In our study 21 cases who had absolute eosinophil count above 500 had elevated CKMB values above 66iu/l .remaining cases of acute coronary syndrome had value of below 60iu/l.[7,8]

Troponin I

According to European heart journal (Vol4, Jan 2018), Troponin I was highly sensitive for acute coronary syndrome, but in our study Troponin I was positive for 38 cases of acute coronary syndrome but according to our observation out of 38 cases 21 cases had an absolute Eosinophil count above 500cells/cumm.

Absolute Eosinophil count

According to study conducted in turkey in 2015, increased eosinophil counts were found to promote thrombus formation and cause acute coronary syndrome. In our study among 100 cases of acute coronary syndrome 21 cases showed absolute eosinophil count of above 500cells/cumm.[3,4]

Ejection fraction

According to study conducted in fudan university in china, increased eosinohil count was associated with decreased ejection fraction. Increased Eosinophil in circulation recruits more number of inflammatory cells and cause lv remodeling after acute coronary syndrome. Moreover eosinophils promote thrombus formation and cause early rupture of thrombus promoting development of ST elevation MI.[7,8]

According to our study, cases with absolute eosinophil count above 500 showed reduced ejection fraction (44%). According to our observation it shows that increased eosinophil count is associated with severity of MI.

Killips class

According to study conducted in University of Baltimore (cardiology department), increased circulating eosinophils recruit more inflammatory cells and they suppress il-17, il-10, negative regulator of inflammation and cause myocardial damage, so patients presenting with increased eosinophil count in acute coronary syndrome presented with class of increased severity because of already damaged myocardium.[9,10]

According to NCBI study, patients with Killip's class of increased severity was associated with increased mortality. According to our study, cases with absolute eosinophil count above 500 presented with Killip's class 4.

According to study conducted by department of cardiology in turkey, 2015, to determine the relation of absolute eosinophil count levels in acute coronary syndrome, coronary angiography was performed and thrombus was confirmed in cases of NSTEMI and STEMI. Among 251 patients who were non smoker and non alcoholic presenting with acute coronary syndrome, absolute eosinophil counts were done and patients with increased absolute eosinophil count was planned for angiogram which showed thrombus at various grades.[11]

According to the study conducted in department of cardiology fudan university in china published in the journal of thoracic diseases (2018), eosinophil count was compared with the Killip's class, CK-MB, troponin I and ejection fraction, one month and early mortality in patients presenting with acute coronary syndrome and taken for PCI. In this study patient with increased eosinophil count showed decreased ejection fraction and Killip's class was severe but CK-MB and Trop I values showed negative correlation.

The findings of our study correlate with the above studies. We found that 21 cases who are non

smoker and non alcoholic with acute coronary syndrome had an absolute Eosinophil count of above 500.

Conclusion

There is a positive correlation of decreased ejection fraction with increased eosinophil count. There is a positive correlation with increased severity of Killip's class with increased eosinophil count. Hence increased eosinophil count can be associated with increased propensity to thrombus formation leading to acute coronary syndrome with increased severity.

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