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ORIGINAL ARTICLE

Prognostic value of IL6 in young adults presenting with acute coronary syndrome

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KEYWORDS

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Abstract *Background:* Interest to evaluate the prognostic value of the inflammatory marker, IL-6 in young patients with ACS.
Methods: 140 young patients (18–40 years old) with ACS, were included in this non-randomized prospective study. They were subjected to (a) full clinical evaluation (b) Laboratory evaluation (c) Standard 12 leads ECG and Echocardiography and (d) coronary angiography. The patients were divided into two groups, those with acute chest pain and positive coronary angiography (110 patients), and those with acute chest pain but with normal coronary angiography (control group, 30 patients).
Results: The IL-6 level was significantly higher in patients with documented CAD compared to the control group (39.56 ± 2.5 Vs 3.83 ± 0.79 $P < 0.001$). IL-6 level was significantly higher in patients with significant lesions who needed to perform PCI (92 patients) than patients with non-significant atherosclerotic plaques needing just medical treatment (18 patients) (45.5 ± 23.17 Vs 9.22 ± 1.93 $P < 0.001$). Higher level of IL-6 in STEMI patients (63 Patients 57%) than NSTEMI (23 Patients 21%) and UA (24 Patients 22%) (49.56 ± 23 Vs 43.5 ± 17 Vs 9.5 ± 2.53 respectively with $P < 0.001$) was observed. The optimal cutoff value for IL-6 level to predict morbidity was 41 pg/ml with a sensitivity of 100%, specificity of 66%, and positive predictive value of 25%, negative predictive value of 100% and the diagnostic accuracy of 69%.
Conclusion: The use of IL-6 as a prognostic marker for ACS may be of Value; it may predict the severity of CAD as well as the mortality and morbidity of young patients with acute coronary syndrome.

1. Introduction

Coronary artery disease (*CAD*) is a devastating disease precisely because an otherwise healthy person may die or become disabled without warning. When the afflicted individual is under the age of 40, the tragic consequences for family, friends, and occupation are particularly catastrophic and unexpected.

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Coronary artery disease may be due to atherosclerotic or inflammatory process. However, both will result in narrowing of the coronary vascular lumen, and thus decreasing the nutritional blood flow.[1]

Active inflammation is detected when there are increased numbers of inflammatory cells in atherosclerotic lesions[2] and elevated concentrations of inflammatory markers in the circulation e.g. *CRP* and *IL-6*.[3] Most of inflammatory cells, macrophages, T-lymphocytes and mast cells produce and secrete inflammatory markers detectable in the circulation. Inflammatory markers are important mediators in the diversified and multi-step cascade of atherosclerosis, which ultimately leads to the rupture of the atherosclerotic plaque.

IL-6 is a pleiotropic cytokine with a broad range of humoral and cellular immune effects relating to inflammation, host defense, and tissue injury. It is a central mediator of the acute-phase response and a primary determinant of hepatic production of C-reactive protein.[4,5]

Although elevated levels of IL-6 have been reported in some chronic inflammatory conditions, epidemiological data evaluating the potential role of IL-6 in early atherogenesis are sparse. Experimental studies indicate that vascular endothelium and smooth muscle cells from normal and aneurysmal arteries produce IL-6.[6] Moreover IL-6 gene transcripts are expressed in human atherosclerotic lesions and it may have procoagulant effects.[7]

Furthermore, prospective studies of apparently healthy[8] as well as high-risk[3] individuals indicate that elevated level of C-reactive protein, a potential surrogate for IL-6 activity is associated with first coronary and cerebro-vascular events. Moreover elevated levels of IL-6 and other acute-phase proteins have been reported among patients with acute coronary syndromes even among those without overt plaque rupture or acute tissue trauma.[9,10]

2. Aim of the work

To study the use of IL6 as a diagnostic biomarker for young patients presenting with acute coronary syndrome, and to assess its prognostic value in predicting CAD severity, clinical course and mortality.

3. Patients and methods

We reciureted 110 patients from all patients who were admitted to the Critical Care Department – Kasr Al Aini – Cairo University matching the inclusion criteria after the local Ethics Committee approved the study protocol.

3.1. Inclusion criteria

Patients age should be $\geqslant 18$ and less than 40 years old with clinical and ECG criteria of acute coronary syndrome ESC Guidelines, [11]:

i. ST-segment elevation MI; defined as: (a) more than 20 min lasting chest pain, (b) $\geqslant 0.1$ mV ST elevation in at least two contiguous leads or new left bundle branch block on initial (ECG), and (c) Elevated cardiac markers (either total creatine kinase (CK) or CK-MB at least twice the upper limit of the normal range, or troponin I or T above individual hospital cut-off for myocardial infarction).
ii. Non ST-segment elevation MI; defined as: (a) more than 20 min lasting chest pain, (b) ST depression and/or T wave abnormalities or even normal ECG, and (c) Elevated cardiac markers.
iii. Unstable Angina; defined as chest pain or ECG changes compatible with ACS with normal cardiac markers.

3.2. Exclusion criteria

Patients under the age of 18 were excluded from the study, as well as older than 40 years. Chronic illness e.g. chronic liver disease, chronic renal failure, acute or chronic inflammatory diseases e.g. rheumatoid arthritis, systemic lupus erythromatosis, active infection e.g. Pneumonia, UTI, malignancy and acute coronary insufficiency secondary to any shock state or secondary to traumatic injury to the heart were also excluded from the study. Post CABG patients with acute coronary syndrome, and when coronary angiography is contraindicated were excluded from the study. Patients who suffered from previous documented Acute Coronary Syndrome were also excluded from the study.

Patients who did not meet any of the exclusion criteria were prospectively included into the study and they were followed up for three months or demise.

All patients were informed about the nature of the study and had to sign an informed consent to participate in the study (including clinical and angiographic evaluation).

3.3. All patients were subjected to the following

3.3.1. Full clinical evaluation

Including history and physical examination with special emphasis on risk factors (diabetes mellitus, hypertension, family history, and smoking). Special attention was given for body mass index (BMI). Patients were classified according to Killip Classifications into[12]: – **Class I**; includes individuals with no clinical signs of heart failure, **Class II**; includes individuals with rales or crackles in the lungs, S3 or elevated venous pressure, **Class III**; describes individuals with frank pulmonary edema, **Class IV** describes individuals in cardiogenic shock or hypotension and evidence of peripheral vasoconstriction.

3.3.2. Laboratory investigations

Routine laboratory investigation for assessment of liver and kidney functions, blood sugar, coagulopathy and cardiac biomarkers were done for all patients.

Serum Interleukin-6 (IL-6) level on admission by: Using human IL-6 ELISA kit, which is an in vitro enzyme-linked immune-sorbent assay (competitive or sandwich technique) for the quantitative measurement of human IL-6 in serum, plasma, cell culture supernatants, and urine. This assay employs an antibody specific for human IL-6 coated on a 96-well plate. Samples and biotinylated anti-human IL-6 are pipetted into the wells. IL-6 present in a sample is captured by the antibody immobilized to the wells and by the biotinylated IL-6 specific detection antibody. After washing away unbound biotinylated antibody, HRP-conjugated streptavidin is pipetted into the wells. The wells are again washed. Following this second wash

step, TMB substrate solution is added to the wells, resulting in color development proportional to the amount of IL-6 bound. The stop solution changes color from blue to yellow and the intensity of the color is measured at 450 nm.

Sampling was done after one hour after admission for all patients.

3.3.3. Standard 12-lead ECG

On admission, after the coronary angiography and every 6 h for 24 h, then daily and whenever indicated.

3.3.4. Imaging studies

(i) Echocardiography: for assessment of the ejection fraction (EF) and the presence of RWMA.[13], images were accepted for analysis according to the guidelines proposed by Gordon et al.[14] when at least 80% of endocardium was seen. (ii) Cardiac catheterization and percutaneous coronary intervention with special attention to collect the following data: (a) TIMI flow grade before any procedure and after final adjunctive interventions and include; (*Grade III* (Complete Reperfusion); Patent epicardial artery with normal flow; *Grade II* (Partial Reperfusion); Patent epicardial artery with opacification of the entire distal artery (however, contrast filling or washout is delayed); *Grade I* (Penetration with Minimal Perfusion); Partial contrast penetration beyond an occlusion with incomplete distal filling., *Grade 0* (No Perfusion) Absent ante grade flow.[15] (b) Number of vessels affected and (c) Severity of the lesions requiring emergency bypass surgery or emergency stenting.[16]

N.B. Coronary angiographic significance means coronary lesion > 70%, or LM > 50% and requires intervention.[17,18]

All patients were followed up for a total period of three months for the following: recurrence of chest pain, arrhythmias either primary or secondary that require pharmacological or interventional treatment, readmission by recurrent myocardial ischemia either unstable angina or myocardial infarction, revascularization either by PCI or CABG, heart failure defined by symptoms and sings of pulmonary congestion requiring the use of specific therapy as diuretics, vasodilators, and inotropic supports, or death. No drop out for our patients had occurred, and telephone call was done for those who could not come to the hospital.

An additional 30 patients presented with chest pain but having normal coronary angiography were included as a control group.

3.4. The statistics

Data were statistically described in terms of range, ±standard deviation (±SD), median, frequencies (number of cases) and relative frequencies (percentages) when appropriate. Comparison of quantitative variables between the study groups was done using Mann Whitney *U* test for independent samples. For comparing categorical data, Chi square (χ^2) test was performed. Exact test was used instead when the expected frequency is <5. Accuracy was represented using the terms sensitivity and specificity of the serum IL-6 levels. Receiver operator characteristic (ROC) analysis was used to determine the optimum cut off value for the studied diagnostic markers. Correlation between various variables was done using Spearman rank correlation equation for non-normal variables. A probability value (*p* value) less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs Microsoft Excel 2003 (Microsoft Corporation, NY, USA) and SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 18 for Microsoft Windows.

Table 1 Demographic and clinical data.

Characteristics	Value
Age {mean ± SD (Range in years}	34.46 (25–39)
Male: Female sex (Ratio)	86: 24 (3.58)
Clinical diagnosis no. of patients (%)	
UA	24 (22%)
NSTEMI	23 (21%)
STEMI	63 (57%)
Risk factors no of patients (%)	
Diabetes Mellitus	47 (42.7%)
Hypertension	58 (52.7%)
Smoker	93 (84.5%)
+ve family history	70 (63.6%)
Dyslipedemia	20 (18.2%)
BMI {mean ± SD (Range; median)}	27.04
ECG changes no of patients (%)	106 (96.4%)
Killip classification no of patients (%)	
Killip I	100 (90.9%)
Killip II	8 (7.3%)
Killip III	2 (1.8%)
Killip IV	0 (0%)
Cardiac markers	
Positive troponin no of patients (%)	86 (78.2%)
CK {mean ± SD (Range; median)}	
1st day	268.36
2nd day	2018 .21
3rd day	1624.65
CK-MB {mean ± SD (Range; median)}	
1st day	26.09
2nd day	175.65
3rd day	129.2
Lipid profile {mean ± SD (Range; median)}	
Total Cholesterol (mg/dl)	258.42
LDL (mg/dl)	158.2
HDL (mg/dl)	43.16
Triglycerides (mg/dl)	128.95
ECHO finding	
EF (%) {mean ± SD (Range; median)}	55.29
RWMA N° of patients (%)	67 (60.9%)
Angiographic finding	
Vessel affected (mean ± SD) (Range-median)	1.35
No. of vessel affected no of patients (%)	
Single vessel	79 (71.8%)
Two vessel	23 (20.9%)
Multi vessel	8 (7.3%)
TIMI flow {mean ± SD (Range; median)}	1.1 ± 1.1 (0–3; 1)
Outcome no of patients (%)	
Morbidity	11 (10%)
Mortality	3 (2.7%)

UA: unstable angina *NSTEMI*: non ST-segment elevation myocardial infarction *STEMI*: ST-segment elevation myocardial infarction *EF*: ejection fraction *SWMA*: segmental wall motion abnormality *BMI*: body mass index *ECG*: electrocardiogram *CK*: createnin kinase *CK-MB*: createnin kinase–MB *HDL*: high density lipoprotein *LDL*: low density lipoprotein *No*: number *SD*: standard deviation.

4. Results

4.1. Demographic and baseline clinical data

See Table 1.

4.2. Interleukin 6 value and its correlation to other variables

The level of IL-6 level showed a marked difference between randomized patients and the control group (mean ± SD "Range" 3.83 Vs 39.56 with $P < 0.001$). Analysis of the data obtained from the coronary angiography showed IL-6 level was proportional with severity of the lesions in the coronary anatomy. It was significantly higher in patients with significant lesions in the angiography (92 patients) than that of those with non-significant lesion (18 patients) and that of the control group (30 patients), (mean ± SD "Range" 45.5 Vs 9.22 Vs 3.83 respectively with $P < 0.001$).

There was statistically insignificant negative correlation between IL-6 level and age ($r = -168$, $P = 0.08$). Also, there was no statistically significant difference in IL-6 level as regards gender (mean ± SD "Range; median" 39.87 for male Vs 38.46for female with $P = 0.809$).

Correlation of IL 6 with different risk factors for CAD showed no significant difference in IL-6 level as regards smoking status or family history. However, the IL-6 level was statistically higher in diabetic patients compared to non-diabetics, and lower in those with history of hypertension than those without Table 2.

Moreover, there was statistically significant positive correlation between IL-6 level (39.56 pg/ml) and BMI mean (27.04) with ($r = 0.507$, P value < 0.001).

Correlation of IL 6 with different clinical parameter documented its rise with increased severity of the clinical condition. The mean IL-6 level was statistically significantly higher in those with Killip class III compared to those with Killip class II or I (Table 3).

The mean level of IL-6 was higher in those with +ve troponin test compared to those with −ve troponin result (mean ± SD 47.95 Vs with $P < 0.001$).

Also, there was statistically significant positive correlation between IL-6 level and CK level in 2nd and 3rd day in the studied patients ($r = 0.560$, P value $< 0.001$and $r = 0.508$ respectively, $P < 0.001$) while there was no significant correlation between IL-6 level and CK level in 1st day ($r = 0.158$, P value $= 0.098$). However, regarding CK-MB there was statistically significant positive correlation from day 1 and for the two successive days. ($r = 0.231$, $P = 0.015$; $r = 0.574$, $P < 0.001$; and $r = 0.488$, $P < 0.001$ respectively).

Table 3 IL-6 Level and Killip classification.

Killip classification	No.	Mean ± SD	Median	P value
Killip I	100	37.45 ± 42.21	37	0.001
Killip II	8	50.38 ± 14.02	51.5	
Killip III	2	102 ± 11.31	102	

The IL-6 level was statistically significantly higher in STEMI patients (63 patients "57%") compared to NSTEMI (23 patients "21%") and UA patients (24 patients "22%"), (mean ± SD "Range; median" 49.56 Vs 43.5 Vs 9.5 respectively with $P < 0.001$).

There was statistically significant positive correlation between IL-6 level and number of affected vessels ($r = 0.341$, P value < 0.001) (Table 4).

The above Table 4 shows how the level of IL6 was directly related to the number of the affected vessels.

- *TIMI flow:* There was highly statistically significant negative correlation between IL-6 level and TIMI Flow (Pre PCI) ($r = -0.348$, $P < 0.001$).

4.3. IL-6 value in relation to the final outcome

- *Mortality:* During the follow up period, 3 patients died due to cardiogenic shock; the IL-6 level was statistically significantly higher in non-survivals compared to the survived group (mean 92.33Vs 38.08 with $P < 0.001$).
- *Morbidity:* During the follow up period, out of 107 patients survived, 6 patients had recurrent chest pain without dynamic ECG changes or needing hospital re-admission, 2 patients were readmitted by recurrent UA/ STEMI, 2 patients subjected to surgical revascularization, and one patient suffered from arrhythmia (Atrial Fibrillation). The IL-6 level was statistically significantly higher in morbid patients compared to others (mean ± 71.4569" Vs 34.26 with $P < 0.001$).

Table 2 IL-6 Level in relation to risk factors.

		No.	Mean ± SD	Median	P value
Diabetes mellitus	Yes	47	45.62 ± 26.3	46	0.028
	No	63	35.05 ± 23.38	33	
Smoker	Yes	93	40.23 ± 23.29	38	0.52
	No	52	45.12 ± 27.46	41.5	
Hypertension	Yes	58	34.59 ± 21.86	35.5	0.027
	No	52	45.12 ± 27.46	41.5	
Family History	Yes	70	43.04 ± 25.45	39.5	0.054
	No	40	33.48 ± 23.59	33.5	
Dyslipidemia	Yes	20	18.40 ± 20.37	10	<0.001
	No	90	44.26 ± 23.67	41.5	

Table 4 IL-6 level and number of vessels affected.

No. of vessels affected	No.	Mean ± SD	Range	Median	*P* value
Single Vessel	79	35.19 ± 23.65	6–135	35	0.001
Two Vessel	23	44.7 ± 23.68	13–91	41	
Multi Vessel	8	68 ± 24.48	35–110	63.5	

4.4. The prognostic ability of IL-6

Receiver operator characteristics (ROC) curve was calculated for the use of IL-6 level as a predictor of morbidity. The area under the ROC curve was 0.884 (95% confidence interval, 0.805–0.964) with $P < 0.001$. The optimal cutoff value for IL-6 level to predict morbidity was 41 pg/ml. This cutoff value has a sensitivity of 100%, specificity of 66%, positive predictive value of 25%, negative predictive value of 100% and the diagnostic accuracy of 69% Fig. 1a.

Also, ROC curve was calculated for the use of IL-6 level as a predictor of mortality. The area under the ROC curve was 0.963 with $P = 0.006$. The optimal cutoff value for IL-6 level to predict mortality was 71 pg/ml. These cutoff values have a sensitivity of 100%, specificity of 89%, positive predictive value of 20%, negative predictive value 100% and the diagnostic accuracy 89% Fig. 1b.

5. Discussion

Cardiac biomarkers are substances that are released into the blood when the heart is damaged or stressed. Measurement of these biomarkers is used to help diagnose, risk stratify, monitor and manage people with suspected ACS and cardiac ischemia.[19]

Whilst cardiac ischemia/infarction is the most prevalent cause of cardiac injury, the search for more meaningful biomarkers now includes those for inflammatory processes and myocardial wall stress where evaluation extends beyond myocardial necrosis.[19]

In the last few years, new biomarkers able to measure the coronary atherosclerotic burden have been investigated. One of these markers is IL-6, however, there were no sufficient studies demonstrating the correlation between IL-6 and ACS in specific age group.[19]

Gotsman I et al.[20] reported that there was significant correlation between tumor necrosis factor-alpha and interleukin-6 with the severity of CAD assessed by the number of obstructed coronary vessels and the severity of the lesions. They found that IL-6 is positively correlated with coronary vessel disease (> 70% stenosis) and the mean number of vessels affected (*P* value < 0.001). Also, Chun-lin L et al.[21] concluded that Serum Hs-CRP and IL-6 levels can be considered as the indexes to judge the degree of CAD and may reflect the activity of plaque in CAD patients ($P < 0.01$).

The present study was concordant with the previous two studies as the mean level of IL-6 was significantly higher in the included patients when compared to the control group.

On studying the relation of IL-6 with age and sex, it had no significant difference regarding those variables, and this was concordant with Dizdarević et al.[22] who compared the levels of IL-6 and IL-10 between 36 patients with ACS and 30 patients with stable angina ($P > 0.05$ for both the age and sex).

On studying the relationship between the IL-6 and other risk factors it was observed that there was no statistically significant difference in IL-6 Level as regards smoking status or family history. Moniek and Cornelis,[23] studied the relationship of the inflammatory markers CRP, IL-6, interleukin-1β (IL-1β) and tumor necrosis factor-α (TNF-α) in smokers and non-smokers. They found that IL-6 and TNF-α were significantly higher in patients than in controls, both in smokers and in non-smokers.

However, we demonstrated that IL-6 level was significantly higher in diabetic patients compared to non-diabetic patients, which is concordant with Paresh et al. and Yaseen et al.[24,25] as they concluded that baseline IL-6 was elevated in diabetic patients than non-diabetic patient. These observations can be explained by that leptin and ROS potentiate the release of circulating cytokines.

Regarding hypertension, the IL-6 level was significantly lower in hypertensive patients when compared with those not hypertensive. This observation was discordant with Bautista et al.[26] who found that the mean levels of IL-6 were significantly higher in hypertensive patients when compared with those not hypertensive. This can be explained by that most of the non-hypertensive patients in our study had other risk factors as diabetes mellitus and dyslipidemia, which elevate IL-6 level.

In the present study, there was statistically significant positive correlation between IL-6 level and BMI mean and this was in concordance with Kaenig[27] who found that the patients with higher BMI had elevated serum IL-6 level.

Also we demonstrated that the IL-6 level was statistically significantly higher in those with ECG changes suggestive of CAD as well as those with RWMA at echocardiography when compared with those without these changes ($P = 0.02$, 0.003 respectively). This matches with the result of a study done by Kaenig[27] who studied 156 patients with ACS and they found that the median level of IL-6 in patient with ACS was (27.2 pg/ml) while in the stable group without ECG changes was (13.4 pg/ml) with a P value of 0.01. Moreover Ikonomidis et al.[28] reported that greater release of IL-6 at peak stress and recovery was observed in patients with increasing number of ischemic segments observed with Echocardiography.

There was statistically significant negative correlation between IL-6 level and EF (%) in the included patients ($r = -0.354$, $P < 0.001$). This result was supported by a study done by Lopez et al.[29] who collected 216 hospitalized patients with ACS and detected baseline serum CRP and IL-6 level; they found a significant negative correlation between IL-6 level and EF% ($P = 0.019$).

Moreover, IL-6 level was statistically significantly higher in those with KILLIP Class III compared to those with KILLIP Class I or II. This result is concordant with Tsutamoto et al.[30] that detected that the Interleukin-6 in the peripheral circulation increases with the severity of heart failure ($P < 0.01$), and the high plasma level of IL-6 is an important prognostic predictor in patients with congestive heart failure.

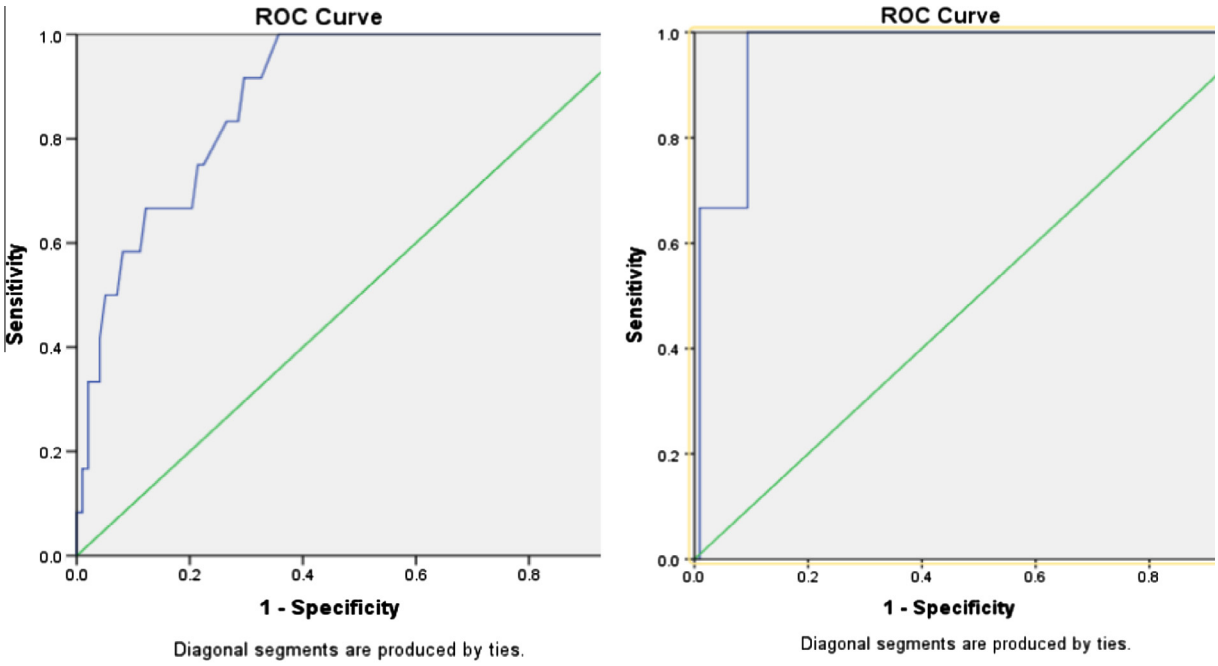

Figure 1 ROC for morbidity (A) and mortality (B).

The relationship between IL-6 level and the different cardiac biomarkers showed that IL-6 was statistically significantly higher in those with + ve Troponin results compared to negative patients. There was statistically significant positive correlation between IL-6 level and serum CK level in 2nd and 3rd day only, however, CK-MB in first, second and third day of randomization. This might be attributed to CK-MB being more sensitive, specific and appears earlier in serum than CK. A study performed by Triyono et al.[31] reported that IL-6 was moderately related to troponin as a marker of acute myocardial injury supporting this observation.

Regarding the angiographic results, there was a significant correlation between IL-6 level and the number of diseased vessels ($r = 0.341$ with $P < 0.001$). Also we found that there was a highly statistically significant negative correlation between IL6 level and TIMI flow (Pre PCI) ($r = -0.348$ with $P < 0.001$). This result is supported by the study performed by EL Oudi et al.[32] who made a comparison of biological parameters including IL-6 with the number of diseased arteries in acute coronary syndrome patients and found highly significant correlation between the mean levels of IL-6 and the number of diseased vessels ($P < 0.001$).

During 3 months of follow up, only 3 patients died by cardiogenic shock. It was noticed that the mean level of IL-6 was statistically significantly higher in non-survivors when compared to the survivors. The ROC analysis used in our study revealed that the optimal cut off value for IL-6 level to predict mortality was 71 pg/ml and this value gave a sensitivity of 100% and specificity of 89%. Regarding the morbidity; out of 107 Patients survived, 6 Patients had recurrent chest pain without dynamic ECG changes or needing hospital admission, 2 Patients were admitted by UA/ STEMI, 2 Patients subjected to surgical revascularization, and one patient suffered from arrhythmia (Atrial Fibrillation). It was noticed that the mean level of IL-6 in these patients was significantly higher compared to uncomplicated patients. The ROC analysis revealed that the optimal cutoff value for IL-6 level to predict morbidity was 41 pg/ml and this value gave a sensitivity of 100% and specificity of 66%.

In young patients with a single culprit lesion, a plaque rupture on a previously non-significant vulnerable plaque is usually the mechanism of acute presentation. Such cases are likely related to acute physical and/or emotional stress, resulting in enhanced coronary shear forces. If these patients do not alter their lifestyles, CAD progression at an earlier age than usual will result, but it may be avoided by following established preventive measures. This group has a substantial vasospastic component superimposed on a genetic predisposition to vulnerable plaque production.[33]

Conversely, a second group is comprised of those with diabetes and others who present with established multi-vessel disease (including those related to lipid abnormalities). These patients are most likely to have rapid progression of a more typical form of *CAD*. They will experience only short-term benefit from revascularization, unless very aggressive control over risk factors is strictly adhered.[33]

Active inflammation and certain morphological and functional features characterize atherosclerotic plaques, which are vulnerable to rupture. Active inflammation is detected as increased numbers of inflammatory cells in atherosclerotic lesions and as elevated concentrations of inflammatory markers in the circulation e.g. *CRP*. Major inflammatory cells, macrophages, T lymphocytes and mast cells, produce and secrete inflammatory markers detectable in the circulation. Inflammatory markers are important mediators in the diversified and multi-step cascade of atherosclerosis that ultimately leads to the rupture of the atherosclerotic plaque.[34] The interaction between a genetic propensity to form vulnerable plaque combined with acute stress and/or an active inflammatory process needs further study.

6. Conclusion, limitations and recommendation

The inflammatory marker; IL-6 (measured by ELIZA which is a relatively simple, rapid and easy assay) may be a potentially useful marker for the evaluation of acute coronary syndrome in young adults. It is a simple test for evaluating the prognosis of these patients, predicting mortality and morbidity. However, due to small sample size of this study, we recommend to perform a large randomized trial to Asses the sensitivity and specificity of IL 6 in young adults presenting with Acute Coronary Syndrome. Other limitation of this study that we used the number of vessels affected rather than myocardium at risk to correlate with level of IL6, so we can predict the prognosis of the patients. If we can better identify and characterize the mechanism of disease in this population, our understanding of CAD in more typical cases will be vastly improved.

Conflict of interest

None declared.

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