RESULTS

The study included 40 patients presented to the National Heart Institute with acute ST segment elevation myocardial infarction during the period from January 2012 till May 2012 and were treated with primary percutaneous coronary intervention.

All patients were subjected to history taking, full clinical examination, venous samples were withdrawn, coronary angiography was recorded and intervention was done accordingly thenthey were followed during hospital stay.The data was collected and analyzed as follows:

Demographic data among study cases

1) Age and Sex

The study included 34 male patients representing 85% and 6 female patients representing 15% only. The mean age was 54 years with standard deviation of 13.3 (**Table 7** and **Figure5**).

Table (7) Description of personal data among study cases

Sex	N	%
Female	6	15%
Male	34	85%

Age	Mean±SD	54	13.3
	Range	25-81	
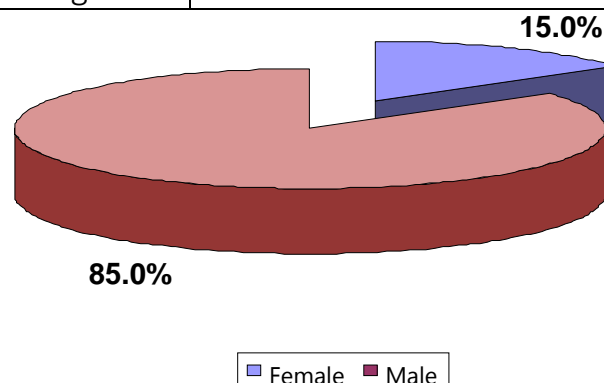
2) Risk factors

Smoking was the most prominent risk factor; 26 smokers (65%) vs. 14 (35%) non-smokers. Regarding the glycemic state 7 patients only (17.5%) were diabetic while 33 were non diabetic representing 82.5%. Hypertension was present in 13 patients (32.5%) vs. 27 without history of hypertension (67.5%). 33 patients (82.5%) had history of ischemic heart disease while 7 patients (17.5%) had no previous history of ischemia(Table 8andFigure6).

Table (8) Risk factors among study cases

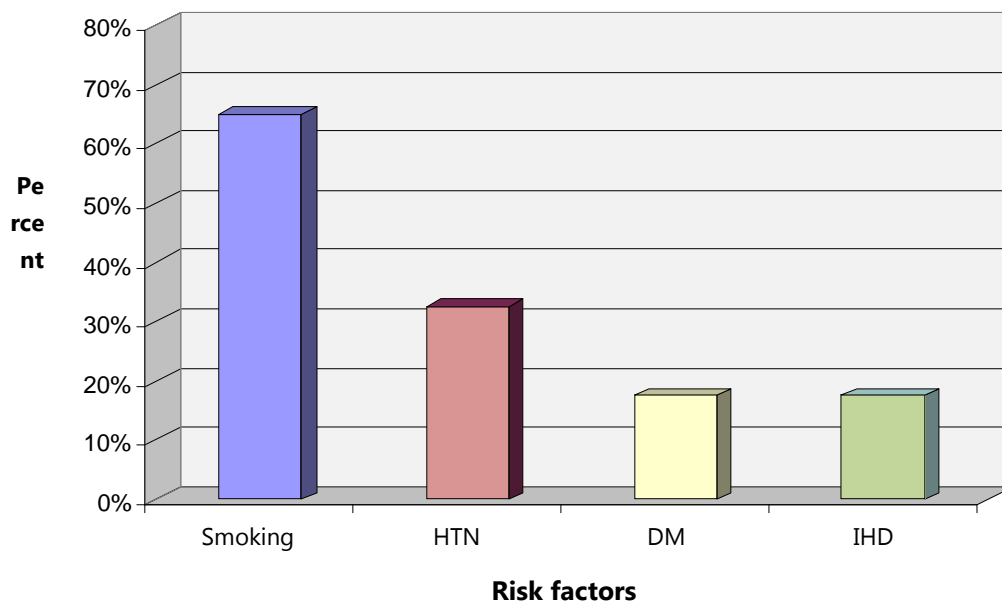|		N	%
Smoking	Yes	26	65%
	No	14	35%
DM	Yes	7	17.5%
	No	33	82.5%
HTN	Yes	13	32.5%
	No	27	67.5%
IHD	Yes	7	17.5%
	No	33	82.5%

Figure (6) Risk factors among study cases

Laboratory results on admission

Uric acid level on admission was of mean value 5.69 mg/dl with 0.91 as standard deviation. Mean value of measured mean platelet volume on admission was 9.53 fl with standard deviation of 1.08. Measuring admission hs-CRP level shows a mean result of 5.333 mg/l with 2.39 as standard deviation **(Table 9)**.

Table (9) Laboratory results among study cases

	Mean	±SD	Minimum	Maximum
Uric Acid mg/dl	5.69	0.91	3.8	7.4
MPV fl	9.53	1.08	7.2	11.3
Hs-CRP mg/l	5.33	2.39	0.35	9.66

Angiographic data

1) Number of diseased vessels among study cases

Coronary angiography showed that single vessel affection was present in 26 patients (65%), 10 patients (25%) presented with two vessel disease, while three vessels affection was noticed in 4 patients (10%)**(Table 9** and **Figure 7)**.

Table (10) Number of diseased vessel among study cases

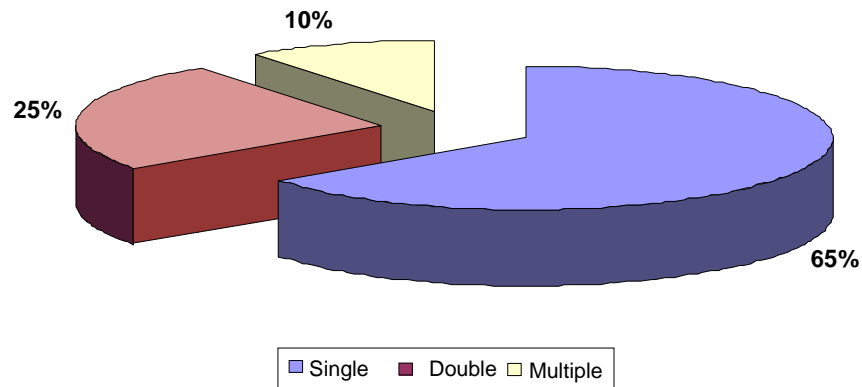| Diseased vessels	N	%
Single	26	65%
Double	10	25%
Multiple	4	10%

Figure (7) Number of diseased vessel among study cases

2) Infarct related artery among study cases

LAD was the infarct related artery in 29 patients representing (72.5%), RCA was the culprit in 9 patients (22.5%) while 2 patients only (5%) had the LCX as the infarct related artery **(Table 11**and **Figure8).**

Table (11)Infarct related artery among study cases

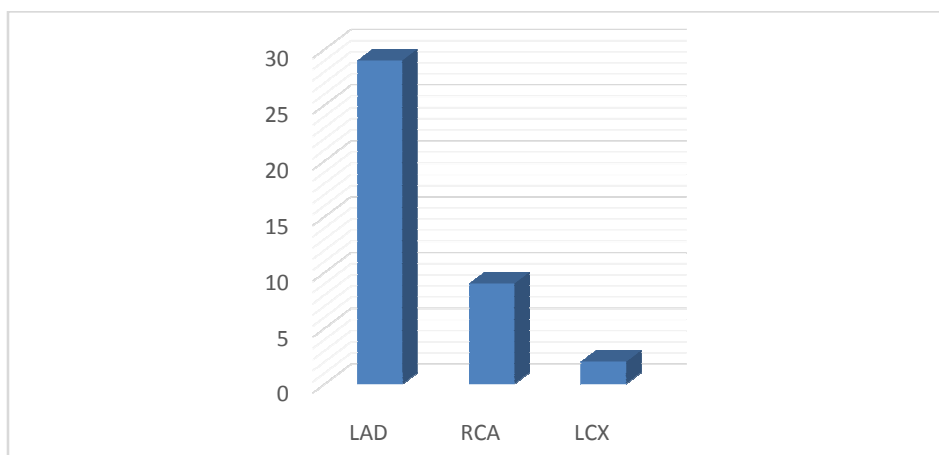| Infarct related artery	N	%
LAD	29	72.5%
RCA	9	22.5%
LCX	2	5%

Figure (8) Infarct related artery among study cases

Interventional procedure

Direct stenting was done for 6 patients (15%) while 34 patients (85%) had undergone balloon predilatation. 28 patients (70%) had one stent vs. 12 patients (30%) had two stents.

Only one case has been stented with a Drug Eluting Stent (DES) (2.5%) while the remaining stents were all Bare Metal Stent (BMS) (39 patients of a percentage 97.5%). IIb/IIIa inhibitors were infused in 24 patients (60%) vs. 16 patients (40%) who did not receive the drug.

Before intervention 34 cases (85%) showed TIMI flow grade of zero, while it was 1, 2 and 3 in 4 (10%), 1 (2.5%) and 1 (2.5%) of the patients respectively.

Glycoprotein IIb/IIIa inhibitors were infused in 24 patients (60%) while 16 patients (40%) did not have IIb/IIIa inhibitors infusion post stenting.

After stenting 27 patients had a TIMI flow grade of 3 and they represent (67.5%) vs. 2 cases of TIMI flow grade 2 (8%) and 1 patient (2.5%) showed TIMI flow grade of 1.

Table (12) Interventional data among study cases

		N	%
Direct stenting	Yes	6	15%
	No	34	85%
Stents No.	One	28	70%
	Two	12	30%
Stent Type	BMS	39	97.5%
	DES	1	2.5%
Use of IIb/IIIa inhibitors	Yes	24	60%
	No	16	40%
TIMI flow Pre	0	34	85%
	1	4	10%
	2	1	2.5%
	3	1	2.5%
TIMI flow Post	1	5	12.5%
	2	8	20%
	3	27	67.5%

Assessment of systolic functionin study cases

Transthoracic echocardiography was performed for each patient immediately after primary PCI in intensive cardiac care unit. Assessment of systolic function showed a mean EF of 49.75% with standard deviation of 9.22 and ranging from 30% to 75%**(Table 13)**

Table (13)LV systolic function among study cases

EF%	Mean±SD	49.75	9.22
	Range	30-75	

Follow up during hospital stay among study cases

During regular follow up; which ranges from 3 to 15 days of hospital stay, 2 patients (5%) had the incidence of in-stent thrombosis and reinfarction while the remaining 38 patients (95%) survived that issue.

6 patients representing 15% of the cases suffered acute heart failure vs. 34 patients (85%) did not had such a morbidity.

Only one patient (2.5%) died during hospital stay while all other 39 patients (97.5%) have been discharged alive.

Over all Major Adverse Cardiac Events (MACE) including in-stent thrombosis, re-infarction, acute heart failure and death;had been reported in 8 patients of the study group (20%) while 32 patients had not developed any of these adverse events during their hospital stay **(Table 14**and **Figure9)**.

Table (14) Description of MACE during hospital stay

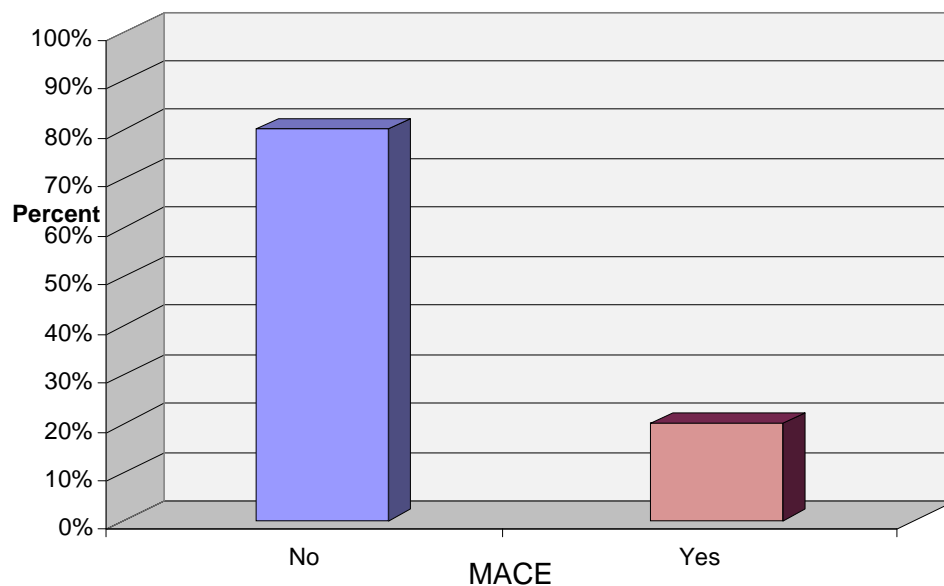|		N	%
In stent thrombosis& re-infarction	Yes	2	5%
	No	38	95%
Acute HF	Yes	6	15%
	No	34	85%
Mortality	Yes	1	2.5%
	No	39	97.5%
MACE	Yes	8	20%
	No	32	80%

Figure (9) Incidence of MACE during hospital stay

The study groups according to TIMI flow grade

Angiographic success as defined by TIMI flow grade of 3 has been noticed in **Group 1** of 27 patients representing 67.5% of all cases while no reflow group of TIMI flow grade 0,1 or 2 (TIMI < 3) were 13 patient representing 32.5% of all study cases and was classed as **Group 2(Table 15**and **Figure10)**.

Table (15)Groups by TIMI flow grade

Group 1	TIMI 3	27	67.5%

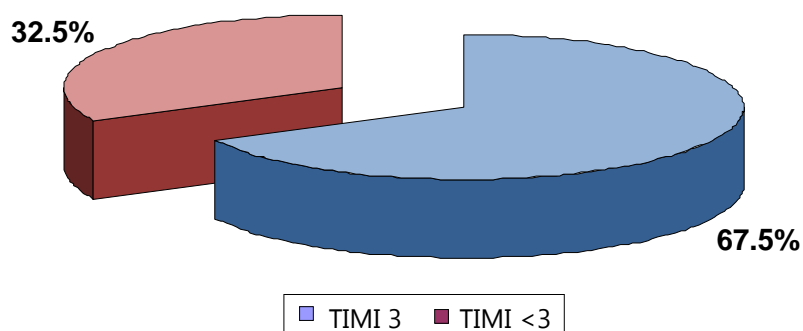| Group 2	TIMI <3	13	32.5%

Figure (10)Percentage of groups by TIMI flow grade

Demographic data in both groups

Male patients represent 81.5% of group 1 (22 patients) while they represent 92.3% of group 2 (12 patients). As regarding females there were 5 cases (18.5%) of group 1 and only one lady in group 2 (7.7%) *(p=0.643)*.

The mean age was 53.8±14.2 years in group 1 while it was 54.5±11.6 years in group 2 *(p=0.881)*.

Table (16) Age and sex of both groups

		Group 1		Group 2		p*	Sig
		N	%	N	%		
Sex	Female	5	18.5%	1	7.7%	0.643*	NS
	Male	22	81.5%	12	92.3%		
Age	Mean±SD	53.8	±14.2	54.5	±11.6	0.881**	NS

*fisher exact
**Student t test

Risk factors in both groups

16 patient of group 1 were smokers (59.3%) vs. 10 patients (76.9%) in group 2. Non-smokers were 11 (40.7%) of group 1 vs. 3 patients (23.1%) of group 2 *(p=0.477)*.

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5 patients (18.5%) of group 1 were diabetic vs. 2 patients (15.4%) of group 2. Non diabetics were 22 (81.5%) of group 1 vs. 11 patients (84.6%) of group 2 *(p=1.0)*.

Regarding hypertension 11 cases (40.7%) of group 1 were hypertensive vs. 2 patients (15.4%) in group 2, while 16 patients (59.3%) of group 1 had no history of hypertension vs. 11 patients (84.6%) in group 2*(p= 0.157)*.

As for the history of ischemia 5 patients (18.5%) of group 1 were ischemic vs. 2 patients (15.4%) of group 2 while no history of ischemia was noticed in 22 patients (81.5%) of group 1 vs. 11 patients (84.6%) of group 2 *(p=1.0)*.

Table (17) Risk factorsin both groups

		Group 1		Group 2		*p**	Sig
		N	%	N	%		
Smoking	No	11	40.7%	3	23.1%	0.477*	NS
	Yes	16	59.3%	10	76.9%		
DM	No	22	81.5%	11	84.6%	1.0**	NS
	Yes	5	18.5%	2	15.4%		
HTN	No	16	59.3%	11	84.6%	0.157*	NS
	Yes	11	40.7%	2	15.4%		
IHD	No	22	81.5%	11	84.6%	1.0*	NS
	Yes	5	18.5%	2	15.4%		

*fisher exact
**Student t test

Admission labs of each group

Mean value of uric acid on admission in group 1 was 5.3±0.8 mg/dl while it was 6.4±0.7 in group 2 *(p=0.0001)*. There was a highly significant relation between both the result and TIMI flow.

In group 1 mean platelet volume was 9.3±0.9 fl while its mean value in group 2 was 10.1±1.2 fl *(p=0.027)*. It was a significant relation.

By measuring high sensitive CRP it was 4.3±1.7 in group 1 while it was 7.4±2.3 in group 2 *(p=0.0001)* and it showed a statistically highly significant relation.

Table(18)Admission labs of each group

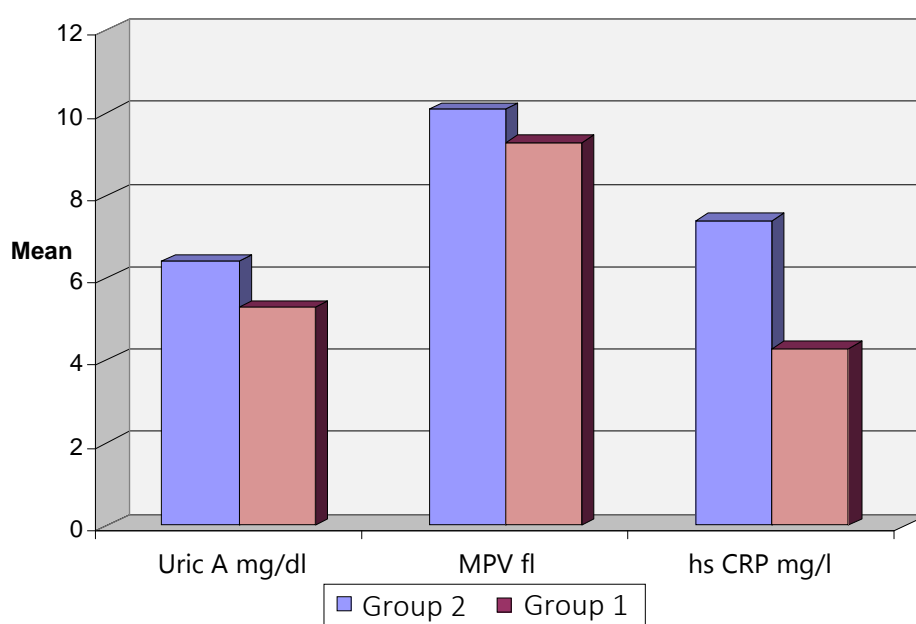|	Group 1		Group 2		*p**	Sig
	Mean	±SD	Mean	±SD		
Uric A mg/dl	5.3	0.8	6.4	0.7	0.0001	HS
MPV fl	9.3	0.9	10.1	1.2	0.027	S
hs CRP mg/l	4.3	1.7	7.4	2.3	0.0001	HS

*student t test

Figure (11) Admission labs in each group

Angiographic findings in each group

Regarding number of diseased vessel in each group, it was single vessel disease in 17 patients (63%) of group 1 vs. 9 patients (69.2%) of group 2. Two or three vessel disease were noticed in 10 cases (37%) of group 1 vs. 4 cases (30.8%) of group 2 *(p=1.0)*.

Infarct related artery proved to be the LAD in 17 patients (63%) in group 1 vs. 12 patients (92.3%) of group 2*(p=0.068)*. The LCX was the

culprit in 2 patients (7.4%) of group 1 while no patients in group 2 had a diseased LCX*(p=1.0)*. 8 patients (29.6%) of group 1 had the RCA as the infarct related artery vs. only one patient (7.7%) in group 2 *(p=0.226)*.

Table (19) Angiographic findings in both groups

		Group 1		Group 2		p*	Sig
		N	%	N	%		
Diseased vessels	Single	17	63%	9	69.2%	1.0	NS
	Double/multiple	10	37%	4	30.8%		
Infarct related artery	LAD	17	63%	12	92.3%	0.068	NS
	LCX	2	7.4%	0	0%	1.0	NS
	RCA	8	29.6%	1	7.7%	0.226	NS

*fisher exact

Invasive therapeutic procedures

In group 1 direct stenting was done in 6 patients (22.2%) while no patients in group 2 had undergone direct stenting. Balloon predilatation was attempted in 21 patients (77.8%) of group 1 vs. all 13 patients (100%) of group 2 *(p=0.152)*.

Only one stent was deployed in 16 patients (59.3%) of group 1 vs. 12 patients (92.3%) of group 2. 11 patients (40.7%) of group 1 had 2 stents vs. only one patient (7.7%) in group 2 *(p=0.63)*.

The used stent was Bare Metal Stent (BMS) in 26 patients (96.3%) of group 1 vs. 13 patients (100%) of group 2. Only one patient of the study cases was stented with a Drug Eluting Stent (DES) and he was in group 1 representing 3.7% of the group *(p=1.0)*.

All patients of group 2 received downstream infusion with GP IIb/IIIa inhibitor while in group 1 only 11 patients (40.7%) were, while 16 patients (59.3%) were not treated by that drug *(p=0.001)*.

Table (20) Invasive therapeutic procedures

		Group 1		Group 2		p*	Sig
		N	%	N	%		
Direct stenting	No	21	77.8%	13	100%	0.152*	NS
	Yes	6	22.2%	0	0%		
Stents No.	One	16	59.3%	12	92.3%	0.063*	NS
	Two	11	40.7%	1	7.7%		
Stent Type	BMS	26	96.3%	13	100%	1.0*	NS
	DES	1	3.7%	0	0%		
Use of IIb/IIIa inhibitors	No	16	59.3%	0	0%	0.001**	HS
	Yes	11	40.7%	13	100%		

*Fisher exact
**chi square

LV systolic function of both groups

Assessment of systolic function by echocardiography; after primary
PCI in the cardiac care unit,showed a mean value of ejection fraction to
be 51.26% with standard deviation of 7.75 in group 1 while in group 2 it
was 46.62% with standard deviation of 11.41 *(p=0.138)*.

Table (21)LV systolic function of both groups

	Group 1		Group 2		p*	Sig
	Mean	±SD	Mean	±SD		
EF %	51.26	7.75	46.62	11.41	0.138‡	NS

‡student t test

Follow up during hospital stay for the incidence of major adverse cardiac events

During follow up of the patients through the hospital stay days; only
one patient of each group has suffered in-stent thrombosis representing 3.7%
of group 1 and 7.7% of group 2, while 26 patients (96.3%) of group 1 vs. 12
patients (92.3%) in group 2 did not suffer that complication *(p=1.0)*.

The same data proved to appear regarding reinfarction with 26 patients (96.3%) of group 1 vs. 12 patients (92.3%) in group 2 *(p=1.0)*.

Acute heart failure was recorded in 2 patients (7.4%) of group 1 vs. 4 patients (30.8%) of group 2, while it did not complicate 25 patients (92.6%) of group 1 vs. 9 patients (69.2%) of group 2 *(p=0.075)*.

Regarding death as a major adverse event, only one patient of the whole study was dead and it was of group 1 (3.7%) *(p=1.0)*.

Table (22) Follow up during hospital stay for the incidence of MACE

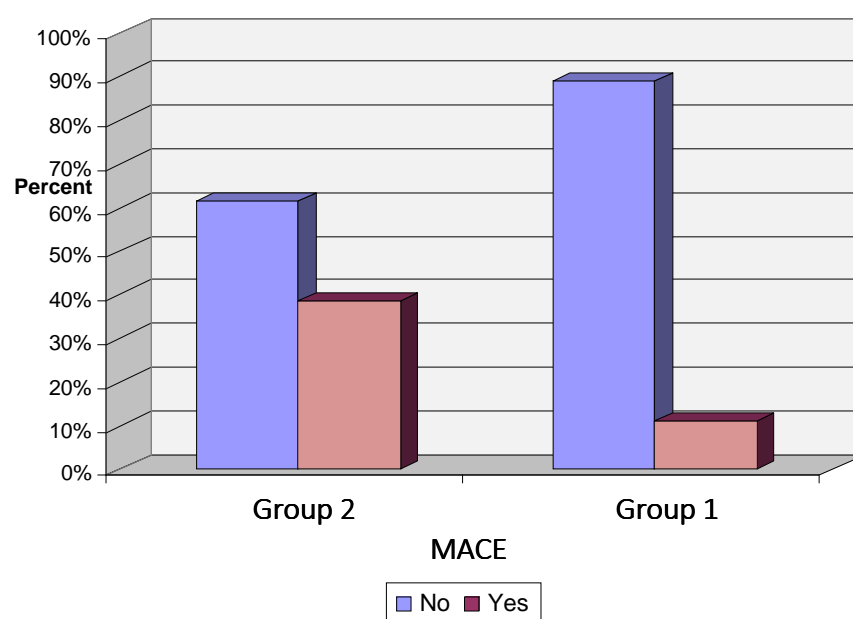|		Group 1		Group 2		p*	Sig
		N	%	N	%		
In-stent thrombosis& re-infarction	No	26	96.3%	12	92.3%	1.0*	NS
	Yes	1	3.7%	1	7.7%		
Acute HF	No	25	92.6%	9	69.2%	0.075*	NS
	Yes	2	7.4%	4	30.8%		
Mortality	No	26	96.3%	13	100%	1.0*	NS
	Yes	1	3.7%	0	0%		
MACE	No	24	88.9%	8	61.5%	0.085*	NS
	Yes	3	11.1%	5	38.5%		

*Fisher exact

Figure (12) Incidence of MACE in both groups

ROC Curve for prediction of impaired coronary flowfrom Uric acid level

Serum uric acid level above 5.95 mg/dl had a sensitivity of 84.6% and specificity of 81.4% in predicting the occurrence of impaired coronary flowand this was highly significant statistically *(p=0.0001)*.

Table (23) Sensitivity and specificity of uric acid in predicting impaired coronary flow

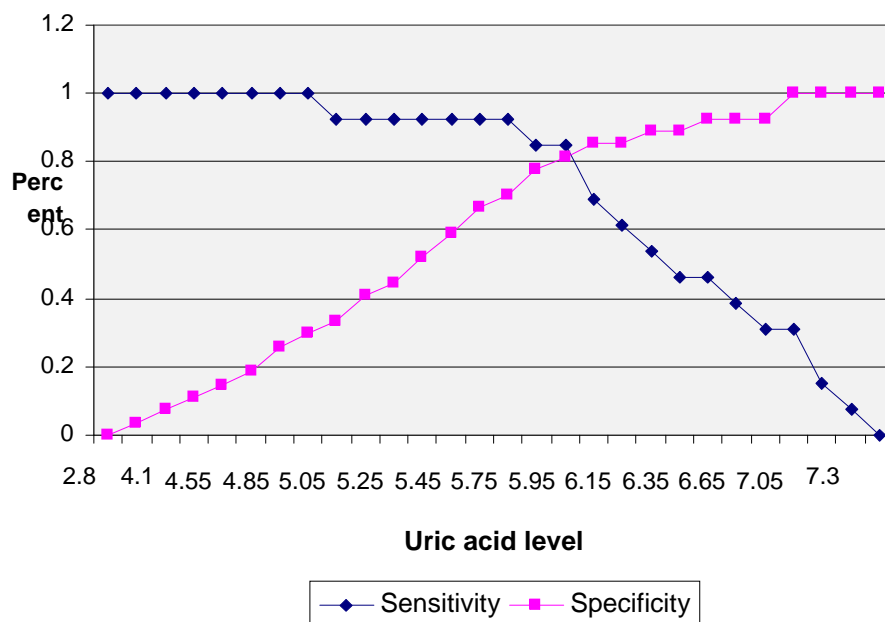| Uric Acid	Sensitivity	Specificity	*p*	Sig
Impaired flow if uric acid ≥5.95 mg/dl	84.6%	81.4%	0.0001	HS

Figure (13) Uric acid in predicting impaired coronary flow

ROC Curve for prediction of impaired coronary flowfrom mean platelet volume level

Serum mean platelet volume (MPV) above 9.5 fl had a sensitivity of 76.9% and specificity of 62.9% in predicting the occurrence of impaired coronary flowand this was statistically significant *(p=0.027)*.

Table (24) Sensitivity and specificity of MPV in predicting impaired coronary flow

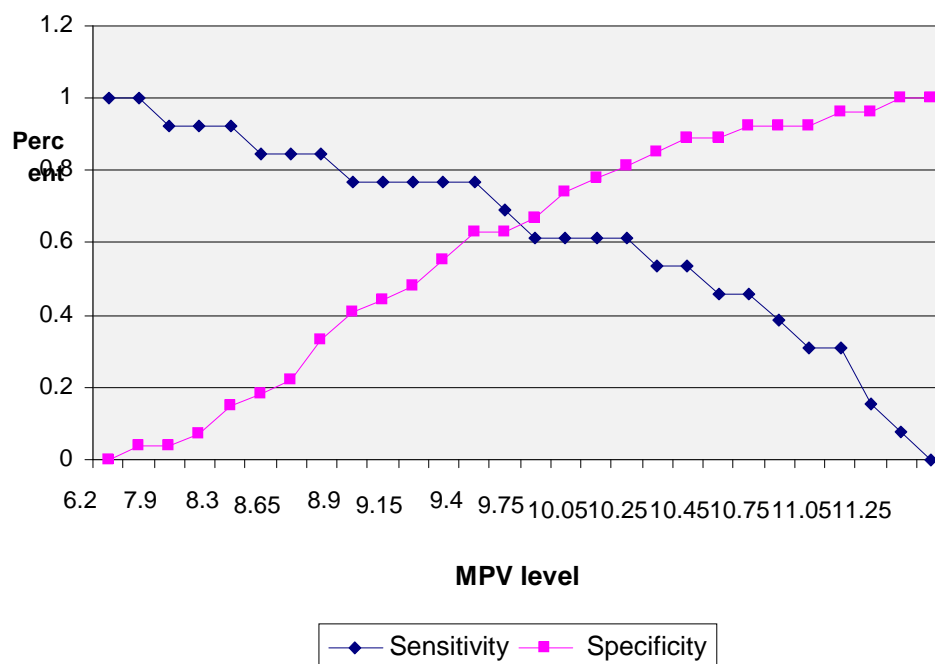| MPV	Sensitivity	Specificity	*p*	Sig
Impaired flow if MPV ≥9.5 fl	76.9%	62.9%	0.027	S

Figure (14) MPV in predicting impaired coronary flow

ROC Curve for prediction of impaired coronary flowfrom high sensitive CRP level

High sensitive C reactive protein (hs CRP) value above 6.2 mg/l had a sensitivity of 84.6% and specificity of 85.1% in predicting the occurrence of impaired coronary flowand this was highly significant statistically *(p=0.0001)*.

Table (25) Sensitivity and specificity of hs CRP in predicting impaired coronary flow

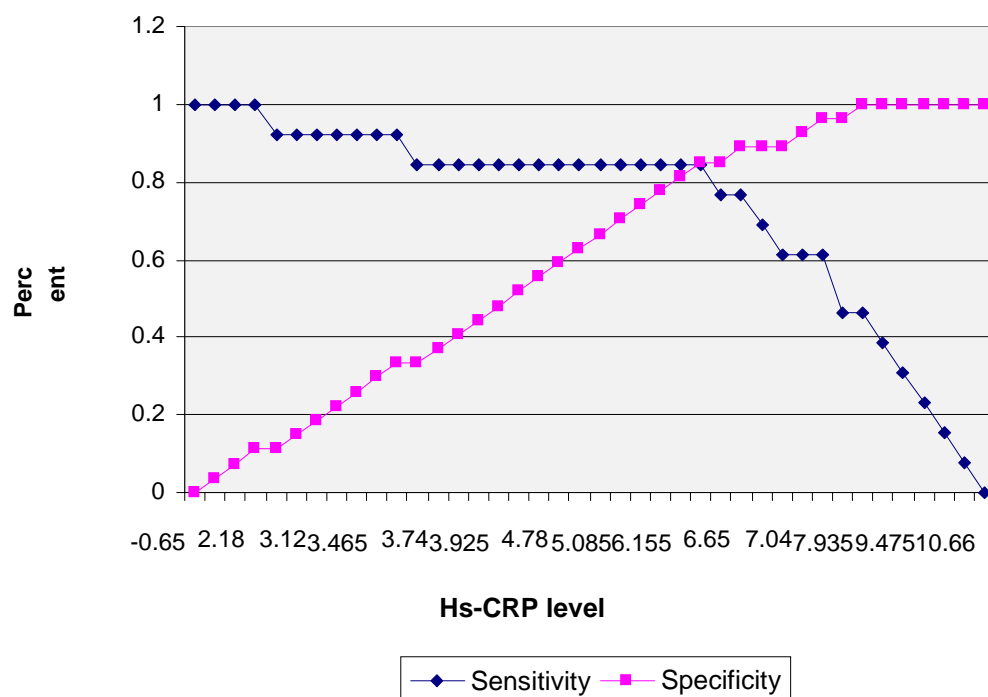| hs CRP	Sensitivity	Specificity	*p*	Sig
Impaired flow if hsCRP ≥6.2 mg/l	84.6%	85.1%	0.0001	HS

Figure (15) Hs CRP in predicting impaired coronary flow

Association of serum uric acid level with TIMI flow and MACE

When the study population was divided into two groups according to the 5.95 mg/dl uric acid level cut-off value used in the ROC analysisinto group 1 with low uric acid level and group 2 as high uric acid level;it was noticed that 22 patients (91.7%) of group 1 showed angiographic success with TIMI 3 flow vs. 5 patients only (31.3%) of group 2, whereas impaired coronary flow has occurred in 2 patients (8.3%) of group 1 vs. 11 patients (68.8%) in high uric acid group. This was highly significant statistically *(p=0.0001)*.

In-stent thrombosis and reinfarction were only recorded in high uric acid groupin 2 patients (12.5%) vs. 14 patients (87.5%) of the same group who did not suffer such complications *(p=0.154)*.

Acute heart failure was noticed in 2 patients (8.3%) of group 1 vs. 4 patients (25%) in group 2, while 22 patients (91.7%) of group 1 vs. 12 patients (75%) of group 2 have not been complicated by heart failure *(p=0.195)*.

The mortality case was recorded in low uric acid group and represent 4.2% of the group vs. no dead patients in high uric acid group *(p=1.0)*.

Overall MACE were higher in group 2; 5 patients (31.3%) vs. 3 patients (12.5%) of the low uric acid group *(p=0.229)*.

Table (26)Association of uric acid with TIMI flow and MACE

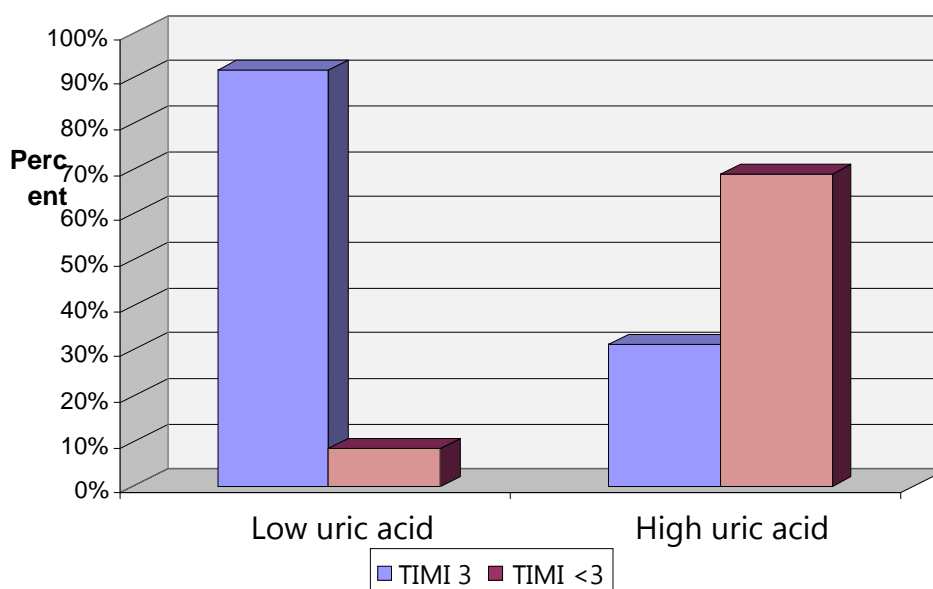|		Uric acid<5.95 mg/dl		Uric acid≥5.95 mg/dl		p*	Sig
		N	%	N	%		
TIMI	TIMI 3	22	91.7%	5	31.3%	0.0001*	HS
	TIMI <3	2	8.3%	11	68.8%		
In-stent thrombosis& re-infarction	No	24	100%	14	87.5%	0.154**	NS
	Yes	0	0%	2	12.5%		
Acute HF	No	22	91.7%	12	75%	0.195**	NS
	Yes	2	8.3%	4	25%		
Mortality	No	23	95.8%	16	100%	1.0**	NS
	Yes	1	4.2%	0	0%		
MACE	No	21	87.5%	11	68.8%	0.229**	NS
	Yes	3	12.5%	5	31.3%		

**chi square
*Fisher exact

Figure (16) Relation between uric acid and TIMI flow

Relation betweenuric acid level and number of diseased vessels

According to the same uric acid level cut-off value used in the ROC analysis; single vessel disease was noted in 16 patients (66.7%) of low uric acid group vs. 10 patients (62.5%) in high uric acid group. Double/Multiple vessel disease occurred in 8 patients (33.3%) of low uric acid group vs. 6 patients (37.5%) of high uric acid group *(p=0.786)*.

Table (27) Relation of uric acid to number of diseased vessels

Diseased vessels	Uric acid<5.95 mg/dl		Uric acid≥5.95 mg/dl		*p**	Sig
	N	%	N	%		
Single	16	66.7%	10	62.5%	0.786*	NS
Double/Multiple	8	33.3%	6	37.5%		

*fisher exact

Relationbetweenimpaired coronary flowandelevated serum levels of uric acid, MPV and hs-CRP

By adding the three studied factors together as predictors of poor TIMI flow and by considering the cut of value of uric acid at 5.95 mg/dl, MPV at 9.5 fl and hs-CRP at 6.2 mg/l, sensitivity for detection of impaired coronary flow post primary PCIwas about 54%, while the specificity was about 96% with a high statistical significance (*p*=0.001) (Table 28 and **Figure 17)**.

Table (28)Relationbetweenimpaired coronary flow and elevated serum levels of uric acid, MPV and hs-CRP

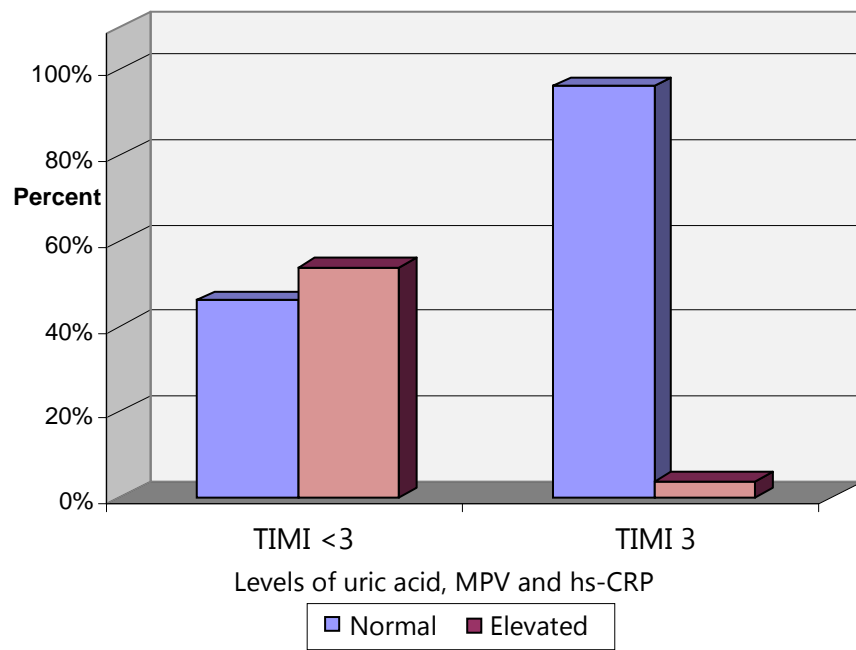| Serum levels of uric acid, MPV and hs-CRP	TIMI <3		TIMI 3		*p*	Sig
	N	%	N	%		
Elevated	7	53.8%	1	3.7%	0.001	HS
Normal	6	46.2%	26	96.3%		

Figure (17) Uric acid, MPV and hs-CRP as predictors of impaired coronary flow