



“CORRELATION OF MICROALBUMINURIA WITH ACUTE MYOCARDIAL INFARCTION”

Internal Medicine

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KEYWORDS

INTRODUCTION:

Acute myocardial infarction is one of the commonest diseases in hospitalized patients¹. The mortality rate of acute myocardial infarction is approximately 30%. Albumin excretion in urine, in the range of 20 to 200 µg/min. (30-300mg/day) is called microalbuminuria². Microalbuminuria has been known to be associated with diabetes mellitus (type I & II over a period of time) and hypertension³. In case of diabetes mellitus, microalbuminuria is an early predictor of renal damage. The presence of increased urinary albumin excretion signals an increase in the transcapillary escape rate of albumin and is therefore a marker of micro vascular disease⁴. It gradually became increasingly evident that microalbuminuria is associated with an increased risk of cardiovascular disease even in non-diabetic and non-hypertensive patients. Microalbuminuria is an early response to myocardial infarction and it is proportional to the infarct size^{5,6}. A study by Berton et. al., showed that occurrence of microalbuminuria predicts early mortality in patients of acute myocardial infarction. In our study, we will evaluate the association of microalbuminuria in patients of myocardial infarction with or without co-morbidities.

Causes Of Microalbuminuria⁶:

Physiological:

- After Exercise
- High protein diet
- Volume expansion
- Pregnancy
- Short stature

Pathological:

- Diabetes mellitus
- Hypertension
- Micro and macro vascular complications of diabetes and hypertension including left ventricular failure.
- Inflammatory diseases like rheumatoid arthritis, pancreatitis or any systemic infection.
- Surgery
- Burns
- Dyslipidemia (increased Apo B, lipoproteins & decreased HDL)
- Insulin resistance
- Increased prorenin (precedes microalbuminuria)

Pathogenesis:

Gosling et.al. opined that the pathogenic mechanism responsible for microalbuminuria in coronary heart disease is increased capillary permeability to plasma proteins due to inflammation which occurs within first few minutes of injury and subsides within 6- 12 hours.

Measurement Of Microalbuminuria:

(i) Semi-quantitative:

This includes test strips most of which are optimized to read “positive” at a predetermined albumin concentration: examples are: -

- a) Albu screen, albu sure
- b) Microalbumin test
- c) Micral test

(ii) Quantitative:

- a) Immunospectrophotometry
- b) Nephelometry

c) Radio immunoassay (RIA)

d) Chemiluminescent immunoassay (CLIA)

MATERIALS AND METHODS:

Study Design:

Observational study

Place Of Study:

Department of General Medicine, Tertiary Care centre.

Duration Of Study:

January 2020 To June 2022 (18 months)

Sampling Method:

Simple random sampling

Inclusion Criteria:

1. Age > 18 years of age.
2. Patients having complaints of chest pain diagnosed as myocardial infarction
3. Patients giving written informed consent

Exclusion Criteria:

1. Age < 18 years
2. Patients not giving written informed consent for this study

Methodology:

The study was conducted in a tertiary care center on 120 patients with acute myocardial infarction. A written informed consent was taken from the participants and their demographic details and clinical history was obtained with the help of pre-decided detailed proforma and investigations done.

Microalbuminuria was assessed with the help of **micral dipstick test (Roche cobas micral test)** which has monoclonal soluble antibody against human albumin labelled with colloidal gold present on a zone of test strip using a morning midstream urine sample. Microalbuminuria was further confirmed with the urine routine analysis done in our pathology laboratory using (**siemens albustix**) dipstick method.

“OBSERVATION AND RESULTS”

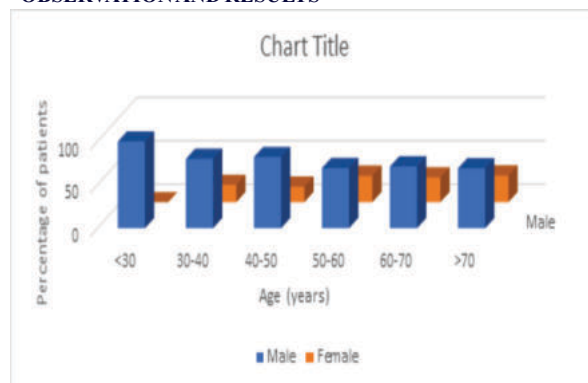


Figure No. 1: Percentage Distribution Of Age (in Years) And Gender Of The Patients Studied

According to above bar diagram, most of the male and female cases were seen between 50 – 60 years of age with the mean age of 55.18 ±12.63 years with male predominance in acute myocardial infarction. No Significant Difference /association found between age and gender distribution in our study with p value of 0.8.

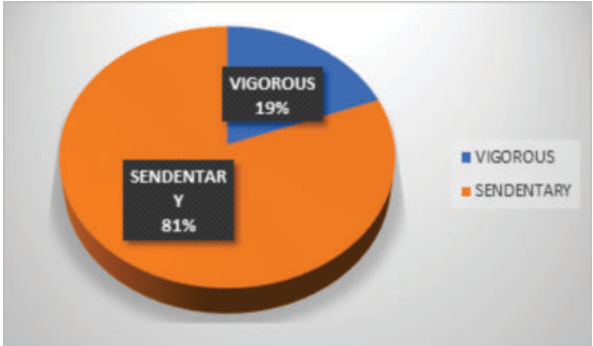


Figure No. 2: Occupational Lifestyle Distribution In Studied Patients

According to the above table, out of 120 patients, about 97 patients have sedentary occupational lifestyle which is considered as a significant risk factor for myocardial infarction.

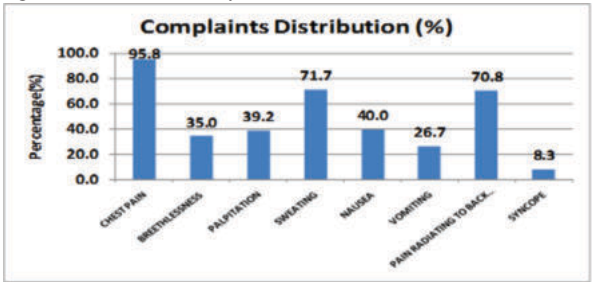


Figure No. 3: Distribution Of The Chief Complaints Of The Patient

According to the above table, about 95.8% patients have chest pain as a most common presenting complaint in an emergency department followed by sweating and pain radiating to back and shoulder.

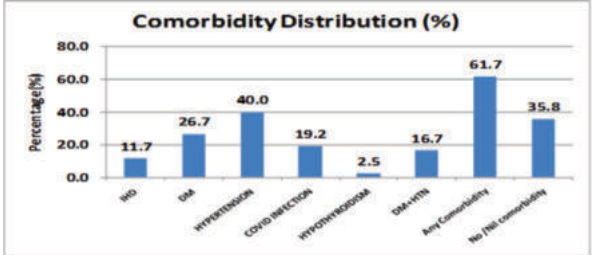


Figure No. 4: Percentage Distribution Of Comorbidities In Patients

According to the table no.8, about 26.7 % patients were suffered from diabetes mellitus, and 40.0% had hypertension. About 16.7% patients have both diabetes mellitus and hypertension.

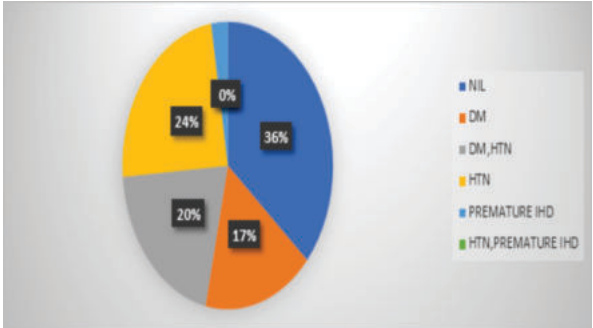


Figure No. 5: Percentage Distribution Of Family History Of Comorbidities

Above figure shows that, out of 120 patients studied, 64.2% patients have positive family history of comorbidities like diabetes mellitus, hypertension or premature IHD.

Table No.1: Blood Pressure Variation In Studied Patients

BP (mmHg)	Number of patients (systolic value)	Number of patients (Diastolic value)
Below normal	28	28
Normal	52	88
Above normal	40	4
Total	120	120

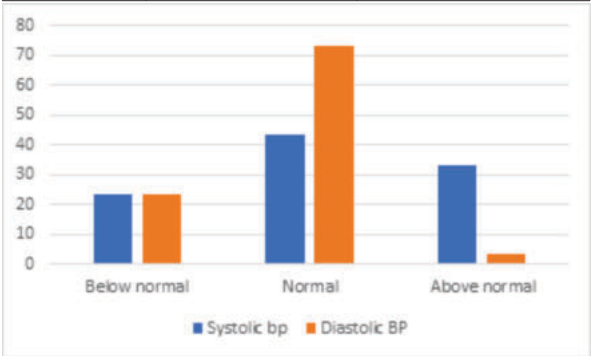


Figure No. 6: Distribution Of Patients With Systolic And Diastolic Blood Pressure

As shown, about 33.3% patients have systolic blood pressure >140 mmHg suggestive of systolic hypertension and about 73.3% patients had diastolic blood pressure > 90mmHg suggestive of diastolic hypertension.

Table No. 2: Obesity Distribution In Studied Patients Based On WHO Classification Of BMI

BMI Categories	Number	Percentage (%)
<18.5	0	0.0
18.5 to 24.99	13	10.8
25.0 to 29.99	41	34.2
30.0 to 34.99	50	41.3
35.0 to 39.99	15	12.5
≥ 40.0	1	0.8
Total	120	100.0

According to the classification of body mass index by the WHO criteria, patients were classified into different categories shown in above table. Out of 120 patients, about 66 patients have body mass index value >30 kg/m² suggestive obesity with a mean value of 30.42 ± 4.12 kg/m².

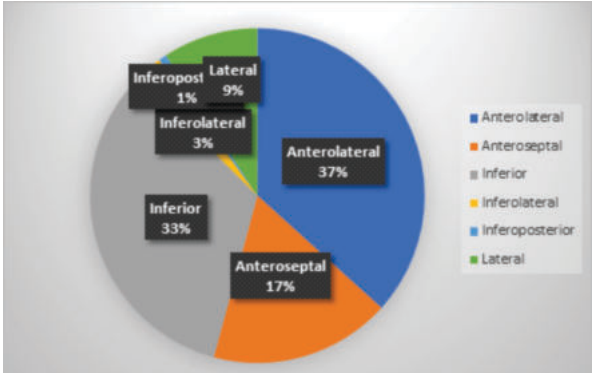


Figure no. 7: Percentage distribution of patients based on type of acute myocardial infarction classified on the basis of electrocardiogram

As shown in the diagram, about 44 patients were diagnosed the anterolateral wall myocardial infarction followed by inferior wall myocardial infarction found in 40 patients.

Lab Investigations:

Table No.3: Haemoglobin Distribution Among The Studied Patients

HB Categories	Male	Female	P value-0.05
Below Normal	47(52.2%)	23(76.7%)	
Normal	39(43.3%)	7(23.3%)	
Above Normal	4(4.4%)	0(0.0%)	
Total	90(100.0%)	30(100.0%)	

As seen in above table, anaemia distribution among the patients studied was done according to UCSF criteria with normal range for male (13.8 -17.2 g/dl) and for females (12.1 to 15.1 g/dL). Study shows maximum prevalence of acute myocardial infarction was found in anemic females. Study found significant difference between 2 groups and association of anaemia with acute myocardial infarction with p value of 0.05.

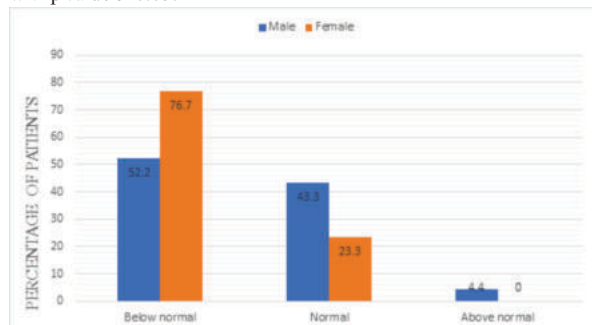


Figure no. 8: Percentage Distribution Haemoglobin Among The Studied Patients

Table No 4: Distribution Of White Blood Cells, Platelet Count And CPK-MB Levels In Studied Patients

WBC Categories (*103/uL)	Number	Percentage (%)
<4.0	2	1.7
4.0 to 11.0	50	41.7
> 11.0	68	56.7
Total	120	1000.0
Platelet count categories (103/uL)	Number	Percentage
<120	9	7.7
120-500	95	79.2
>500	16	13.3
Total	120	100
CKMB (IU/l) Categories	Number	Percentage (%)
> 25.0	120	100.0
Total	120	100.0

According to above table, about 56.7% of patients have white blood cell count >11,000/dl suggestive of leucocytosis as a response to necrotic insults found in patients of myocardial infarction. Out of 120, about 13.3% patients have platelet count >500 (10³/uL) suggestive of thrombocytosis. In our study, CKMB level ranges between minimum of 29 IU/L to maximum of 327 IU/L with mean of 107.35 ± 65 IU/L.

Table No.5: Micral Dipstick Test Result Distribution In Studied Patients

Urine test	Number	Percentage (%)
Nil (<20 mg/L)	26	21.7
1+ (>20-50mg/L)	28	23.3
2+(>50mg/L)	66	55.0
Total	120	100.0

Above table shows about 28 patients of acute myocardial infarction had 1+ microalbuminuria i. e. in the range of >20-50 mg/L and about 66 patients had 2+ microalbuminuria i. e. >50-300 mg/L.

Table No.6: Urine Routine Analysis Distribution In Studied Patients (Using Albusticks):

Urine test	Number	Percentage (%)
Trace	77	64.2
1+ (<0.3g/L)	32	26.7
2+ (0.3-1g/L)	9	7.5
3+(>1g/L)	2	1.7
Total	120	100.0

As mentioned in table, about 109 patients have urine albumin level up to 300 mg /L measured by using siemens albustix done on urine sample collected in the morning.

Table No.7: Comparison Of Micral Dipstick Test Results Between Diabetic And Non-diabetics:

Micral dipstick test	Number (percentage) of diabetic patients	Number (percentage) of non-diabetic patients	P value-<0.001
Trace	8 (25.0%)	69 (78.4%)	
1+ (<0.3g/L)	15 (46.7%)	17 (19.3%)	
2+ (0.3-1g/L)	8 (25.0%)	1 (1.1%)	
3+(>1g/L)	3 (3.1%)	1 (1.1%)	
Total	32	88	

Nil (<20 mg/L)	2 (6.3%)	24 (27.3%)	
1+ (>20-50mg/L)	3 (9.4%)	25 (28.4%)	
2+(>50mg/L)	27 (84.4%)	39 (44.3%)	
Total	32	88	

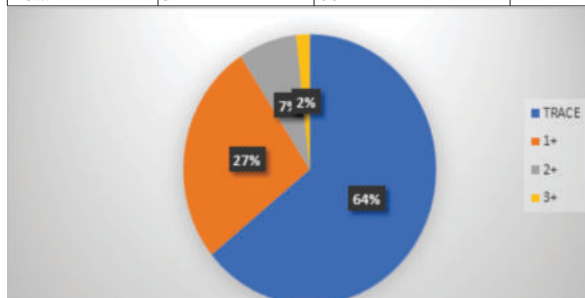


Figure no.9: Percentage Distribution Of Urine Routine Analysis Results

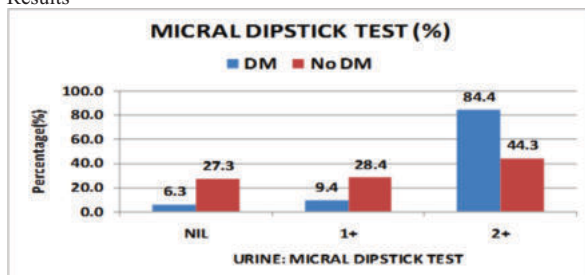


Figure no.10: Comparison Of Micral Dipstick Test Results Between Diabetic And Non-diabetics

As mentioned in a table, out of 32 patients who are suffered from only diabetes mellitus, 30 patients had microalbuminuria micral test >20mg/L. In rest of the 88 patients who may or may not be suffered from any comorbidity other than or in addition to diabetes mellitus, about 64 patients had microalbuminuria. Study shows significant difference in micral dipstick with P value <0.001.

Table No.8: Comparison Of Urine Routine Microscopy Test Results Between Diabetic And Non-diabetic Groups:

Urine routine microscopy	Number (percentage) of diabetic patients	Number (percentage) of non-diabetic patients	P value -<0.001
Trace	8 (25.0%)	69 (78.4%)	
1+ (<0.3g/L)	15 (46.7%)	17 (19.3%)	
2+ (0.3-1g/L)	8 (25.0%)	1 (1.1%)	
3+(>1g/L)	3 (3.1%)	1 (1.1%)	
Total	32	88	

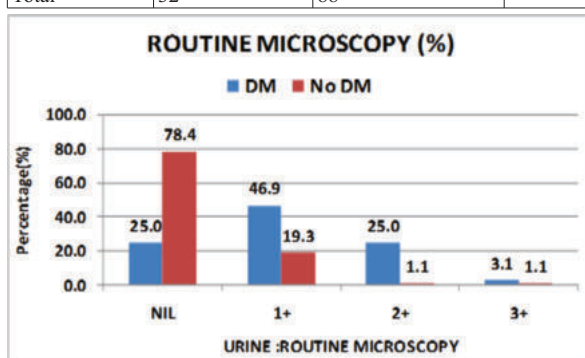


Figure no.11: Comparison Of Urine Routine Microscopy Test Results Between Diabetic And Non-diabetic Groups:

According to the table mentioned above, when we tested for microalbuminuria with the help of siemens albustix, out of 32 patients who are suffered from only diabetes mellitus, it showed that 23 patients had microalbuminuria up to 300 mg/L. In rest of the 88 patients who may or may not be suffered from any comorbidity other than diabetes mellitus, about 86 patients had microalbuminuria up to 300mg/L. Study shows significant difference with P value <0.001.

Table No. 9 : Comparison Of Micral Dipstick Test Results Between Hypertensive And Non-hypertensive Groups

Micral dipstick test	Number (percentage) of hypertensive patients	Number (percentage) of non-hypertensive patients	P value – 0.23
Nil (<20 mg/L)	8 (16.7%)	18 (25.0%)	
1+ (>20-50mg/L)	9 (18.8%)	19 (26.4%)	
2+(>50mg/L)	31 (64.6%)	35 (48.6%)	
Total	48	72	

As mentioned in above table, in patients suffered from only systemic hypertension, when we tested for microalbuminuria with the help of micral dipstick, it showed that about 40 patients out of total 48 patients had microalbuminuria >20mg/L. In remaining 72 patients who may or may not be suffered from any comorbidity other than systemic hypertension, about 54 patients had >20mg/L. Study shows no significant difference with P value 0.23.

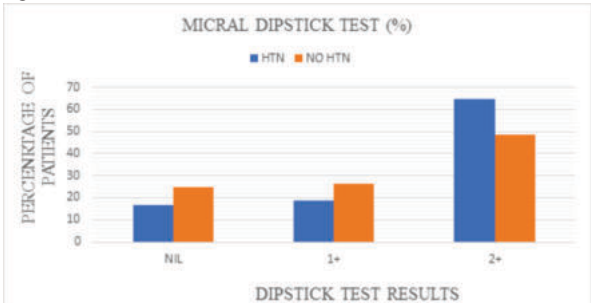


Figure no.12: Comparison Of Micral Dipstick Test Results Between Hypertensive And Non-hypertensive Groups

Table No.10: Comparison Of Urine Routine Analysis Results Between Hypertensive And Non-hypertensive Groups:

Urine routine microscopy	Number (percentage) of hypertensive patients	Number (percentage) of non-hypertensive patients	P value – 0.023
Trace	24(50.0%)	53 (73.6%)	
1+ (<0.3g/L)	16 (33.3%)	16 (22.2%)	
2+ (0.3-1g/L)	6(12.5%)	3 (4.2%)	
3+(>1g/L)	2 (4.2%)	0 (0.0%)	
Total	48	72	

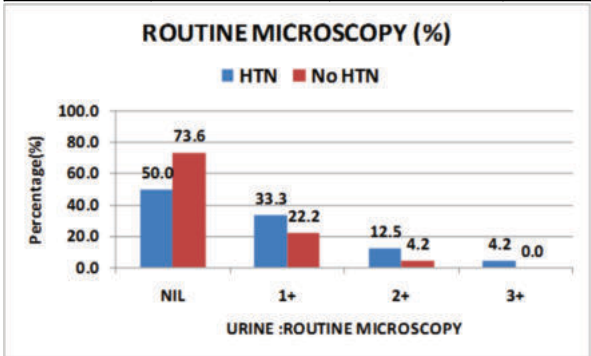


Figure no.13: Comparison of urine routine analysis results between hypertensive and non-hypertensive groups:

Above mentioned table suggests that about 40 out of 48 patients who are suffered from only systemic hypertension had microalbuminuria up to 300 mg/L. In remaining 72 patients who may or may not be suffered from any comorbidity other than systemic hypertension, about 69 patients had microalbuminuria up to 300mg/L. Study shows significant difference with P value 0.023.

Table No.11: Comparison Of Micral Dipstick Test Results Between Patients With And Without Comorbidities (Diabetes And Hypertension)

Micral dipstick test	Number (percentage) of patients with comorbidity	Number (percentage) of patients without comorbidity	P value – 0.003
Nil (<20 mg/L)	1 (5.0%)	25 (25.0%)	
1+ (>20-50mg/L)	1(5.0%)	27 (27.0%)	
2+(>50mg/L)	18 (90.0%)	48 (48.0%)	
Total	20	100	

Nil (<20 mg/L)	1 (5.0%)	25 (25.0%)	
1+ (>20-50mg/L)	1(5.0%)	27 (27.0%)	
2+(>50mg/L)	18 (90.0%)	48 (48.0%)	
Total	20	100	

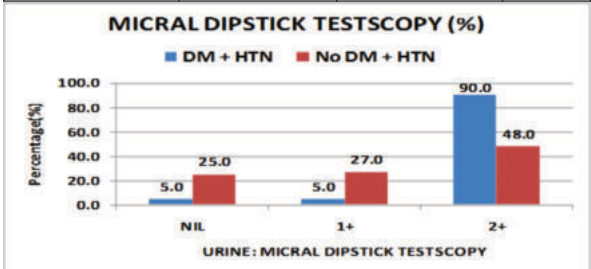


Figure no.14: Comparison Of Micral Dipstick Test Results Between Patients With And Without Comorbidities (Diabetes And Hypertension)

As mentioned in above table, about 19 patients out of total 20 patients with comorbidities had microalbuminuria >20mg/L. In remaining 100 patients without comorbidities (diabetes mellitus and systemic hypertension), about 75 patients had microalbuminuria >20mg/L. Study shows significant difference with P value 0.003.

Table No.12: Comparison Of Urine Routine Microscopy Test Results Between Patients With And Without Comorbidities (Diabetes And Hypertension):

Urine routine microscopy	Number (percentage) of patients with comorbidity	Number (percentage) of patients without comorbidity	P value - <0.001
Trace	3(15.0%)	74 (74.0%)	
1+ (<0.3g/L)	10 (50.0%)	22 (22.0%)	
2+ (0.3-1g/L)	6(30.0%)	3 (3.0%)	
3+(>1g/L)	1 (5.0%)	1 (1.0%)	
Total	20	100	

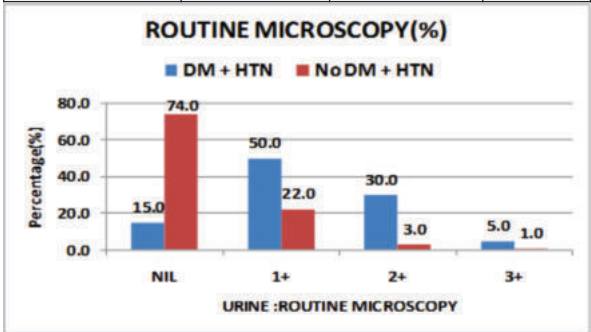


Figure no.15: Comparison Of Urine Routine Microscopy Test Results Between Between Patients With And Without Comorbidities (diabetes And Hypertension)

According to the above table, about 13 out of 20 patients with comorbidities and 74 out of 100 patients without comorbidities up to 300mg/L. Study shows significant difference with P value <0.001.

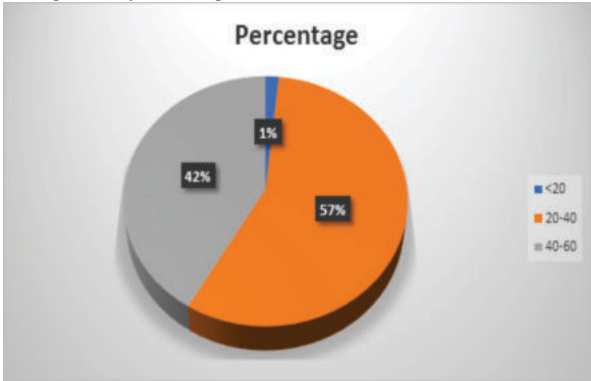
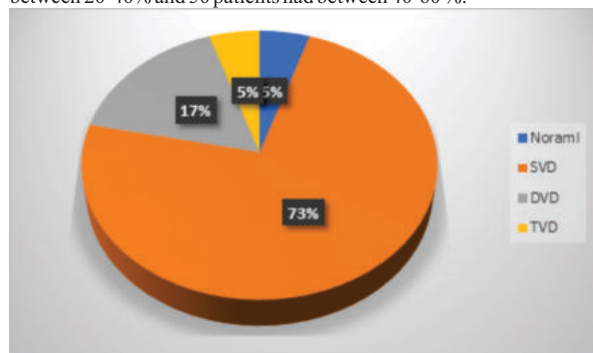


Figure no. 16: Percentage distribution of 2 D echocardiography findings in studied patients

Table No. 13: Distribution Of 2 D Echocardiography Findings In Studied Patients

EF (%)	Number	Percentage
<20	2	1.66
20 -40	68	56.66
40-60	50	41.66
Total	120	100.0

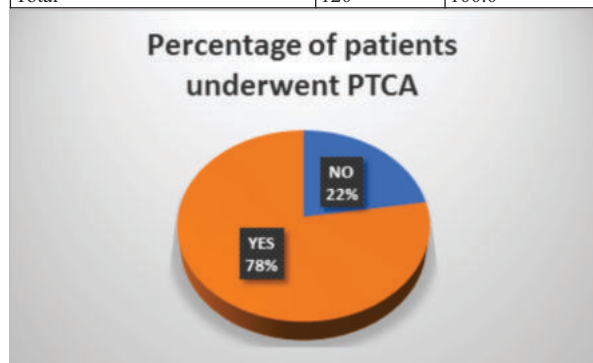
As per above table, about 68 patients were having ejection fraction between 20-40% and 50 patients had between 40-60 %.

**Figure no.17: Percentage Wise Distribution Of CAG Findings In Patients**

As mentioned in above, about 115 patients underwent coronary angiography. About 88 patients diagnosed with single vessel disease.

Table No. 14: Distribution Of Patients Underwent Percutaneous Transluminal Coronary Angioplasty

Patients who underwent PTCA	Number	Percentage (%)
Yes	93	77.5
No	27	22.5
Total	120	100.0

**Figure no. 22: Percentage of patients underwent PTCA**

Above table suggests that, 93 out 120 patients underwent PTCA as a therapeutic invention.

SUMMARY

- Prevalence of acute myocardial infarction increases with the increase in age of individual and most commonly found in patients >50 years of age and more common in males as compared to females.
- Risk of acute myocardial infarction increases with the sedentary lifestyle, presence of co-morbidities like diabetes mellitus and hypertension, obesity with body mass index $>30 \text{ kg/m}^2$.
- Chest pain was found to be most common symptom followed by sweating among patients with acute myocardial infarction.
- Increased blood pressure in patients admitted with known case of systemic hypertension was found to be significantly associated with acute myocardial infarction.
- About 36.7% of patients were diagnosed with anterolateral myocardial infarction on the basis of electrocardiogram.
- Prevalence of anaemia was found more in the post-menopausal females i. e. >50 years of age admitted with acute myocardial infarction.
- 56.7% of patients admitted with acute myocardial infarction patients showed leucocytosis.

- Creatinine kinase (CK-MB) was found to be raised in all (120) patients of acute myocardial infarction patients in our study.
- On bedside investigation of microalbuminuria with urine micral dipstick test, 78.3% of patients of acute myocardial infarction had microalbuminuria with value $>20 \text{ mg/L}$.
- There was a significant difference found in presence of microalbuminuria when compared between the patients with or without comorbidities ($p < 0.001$) admitted with acute myocardial infarction.
- About 56.66% of patients with acute myocardial infarction had ejection fraction between 20-40% on echocardiography suggestive of decreased systolic function of myocardium.
- On coronary angiography, about 73.3% of patients were diagnosed with single vessel disease, 16.6% diagnosed with double vessel disease and 5.0% patients had triple vessel disease and 77.5% patients underwent percutaneous coronary angioplasty as a therapeutic intervention.

CONCLUSION

Present study shows a significant difference found in presence of microalbuminuria when compared between the patients with or without comorbidities on bedside investigation of microalbuminuria with urine micral dipstick test and can be considered as an important prognostic marker in patients of acute myocardial infarction.

From the present study, we conclude that

- Microalbuminuria is significantly associated with acute myocardial infarction.
- Microalbuminuria shows a significant association with the comorbidities like diabetes mellitus and hypertension on bedside urine micral dipstick test.

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