

ORIGINAL RESEARCH

TO STUDY THE CLINICAL PRESENTATION AND BIOCHEMICAL PROFILE OF PATIENT WITH MYOCARDIAL INFARCTION WITH NONOBSTRUCTIVE CORONARY ARTERIES (MINOCA)

¹Dr. Pranshu Joshi, ²Dr. Pankaj Kumar Gupta, ³Dr. FarazAdil, ⁴Dr.
ShubhamUpadhyay, ⁵DrSeema

¹⁻⁵PG student, Department of Medicine, GRMC Gwalior, M.P., India

Correspondence:

Dr. ShubhamUpadhyay

PG student, Department of Medicine, GRMC Gwalior, M.P., India

Email: drshubham.upadhyay2002@gmail.com

ABSTRACT

Background: Studies have reported a prevalence of MINOCA of 5% to 6% of AMI cases¹. The demographic and clinical characteristics of MINOCA patients differ from other patients with MICAD.

Objective: To study the clinical presentation and biochemical profile of patient with Myocardial Infarction with non obstructive coronary arteries (MINOCA) in comparison to patient with Myocardial Infarction with obstructive coronary artery disease (MICAD).

Material and methods: Present study prospective comparative study was conducted in the Department of Cardiology, G.R. Medical College, Gwalior (M.P.) on an inpatient basis. Duration of study was One and half years. (Nov. 2019 to June 2021) A total of 214 patients presenting with Myocardial infarction who underwent coronary angiography were studied during this period. Our study consist of two groups of patients based on their angiographic findings that were patients with MINOCA (N=107) and patients with MI with obstructive coronary artery disease (MICAD) (N=107) which were compared based on their clinical profile and biochemical parameters.

Results: Chest pain was the most common presenting symptom among patients with MINOCA (70.1%) and Ghabrahat (83.2%) was the most common presenting symptom among patients with MICAD. Patients with MINOCA more commonly presents with atypical complaints (37.4% vs 15.9%) whereas signs and symptoms of heart failure were less common among patients with MINOCA as compared to patients with MICAD. Biochemical Abnormalities like High random blood sugar levels (8.4% vs 30.8%), hypercholesterolemia (24.3% vs 46.70%) and hypertriglyceridemia (8.40% vs 23.40%) were less prevalent whereas reduced

hemoglobin levels or Anemia (71%vs44.9%)was more prevalent among patients with MINOCA as compared to patients with MICAD.

Conclusion:Patients with MINOCA most commonly presents with chest pain. Atypical complaints was more common whereas symptoms and signs of heart failure were less common among patients with MINOCA as compared to patients with MICAD.Biochemical Abnormalities like High random blood sugar levels, hypercholesterolemia and hypertriglyceridemia were less prevalent whereas reduced hemoglobin levels (Anemia)was more prevelant among patients with MINOCA as compared to patients with MICAD.

Keywords:-MINOCA,MICAD, MI

INTRODUCTION

According to the recent guidelines Myocardial infarction with non obstructive coronary arteries (MINOCA) is defined by the evidence of spontaneous acute myocardial infarction (MI) and angiographic exclusion of coronary stenosis $\geq 50\%$ in any potential infarct related artery, after having ruled out other clinically overt causes for the acute presentation¹⁸. Clinical studies have reported a prevalence of MINOCA of 5% to 6% of AMI cases with a range between 5% and 15% depending on the population examined¹. The demographic and clinical characteristics of MINOCA patients differ from other patients with AMI^{1,2-4}The prevalence of conventional CAD risk factors and clinical features also varies among patients with MINOCA versus AMI-CAD^{1,2,4,5}. The reasons for these are varied. Thrombosis, embolism and vasospasm are believed to be the mechanisms of ischemia and infarction in these cases^{6,7}. Intravascular thrombosis can result from hematological disturbances as in protein S deficiency and high progestational states in females⁸. Coronary embolism has been reported with prosthetic and abnormal valves, endocarditis and cardiac arrhythmias⁹. Vasospasm is an important mechanism in cocaine and amphetamine induced infarction^{10,11}. Currently, local studies have not been performed to determine the clinical presentation and biochemical characteristics of patients having normal coronary angiogram. The aim of this study was to know the clinical presentation and bio-chemical profile of such patients. It will help identify such patients thus avoiding invasive investigations. In addition, it will reduce unnecessary cost and burden on our catheterization laboratory.

OBJECTIVES

1. To study the clinical presentation of patient with myocardial infarction with non obstructive coronary arteries (MINOCA)in comparison to patients with myocardial infarction with obstructive coronary artery disease(MICAD).
2. To study the Biochemical profile of patient with myocardial infarction with non obstructive coronary arteries (MINOCA)in comparison to patients with myocardial infarction with obstructive coronary artery disease.

MATERIALS AND METHODS

Present study prospective comparative study will be conducted in the Department of Cardiology, G.R. Medical College, Gwalior (M.P.) on an inpatient basis. Sample size: 214 patients Duration of study: One and half years. (Nov. 2019 to June 2021) A total of 214

patients presenting with myocardial infarction who underwent coronary angiography were studied during this period. Our study consist of two groups of patients based on their angiographic findings that were patients with myocardial infarction with normal coronary arteries (N=107) and patients with myocardial infarction with obstructive coronary artery disease (N=107) which were compared based on their clinical presentation (Detailed history and examination) and biochemical profile (CBC, RFT, LFT, LIPID PROFILE).

INCLUSION CRITERIA

Patients presenting with Myocardial Infarction who underwent coronary angiography.

EXCLUSION CRITERIA

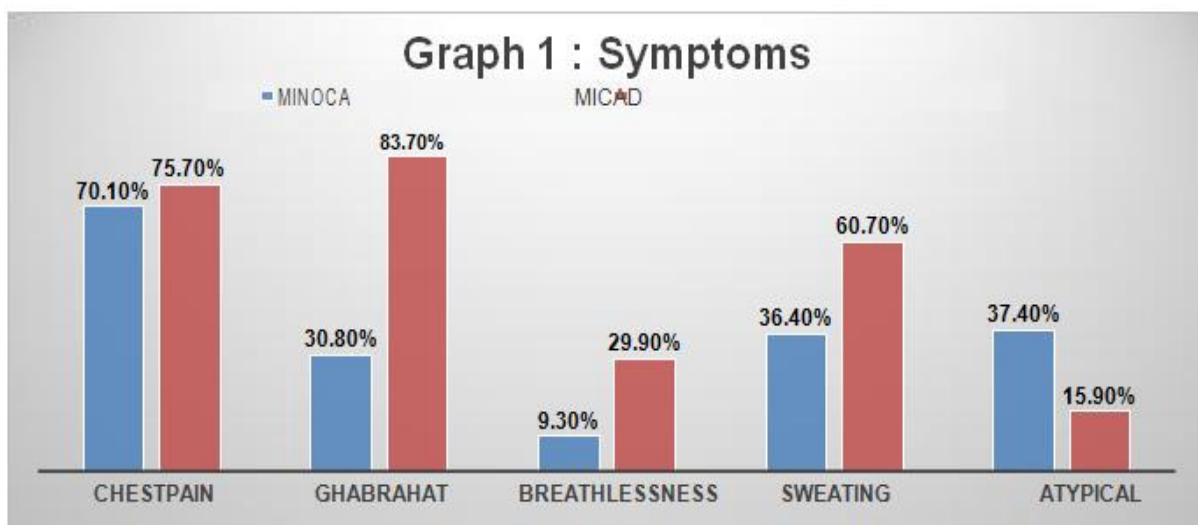
- Patient age < 18 years.
- Previous history of Percutaneous Intervention.
- Documented coronary artery disease in previous angiogram
- Patients who refuse to give written informed consent.

RESULTS

Table-1: Comparison between patients with MINOCA and MICAD based on Symptoms

SYMPTOMS	MINOCA	MICAD	PValue (p<0.05-significant)
Chest pain	70.10%	75.70%	0.356
Ghabrahat	30.80%	83.20%	0.000
Breathlessness	9.30%	29.90%	0.000
Sweating	36.40%	60.70%	0.000
Atypical complaints	37.40%	15.90%	0.000

Comparison between Patients with MINOCA and MICAD based on presenting symptoms

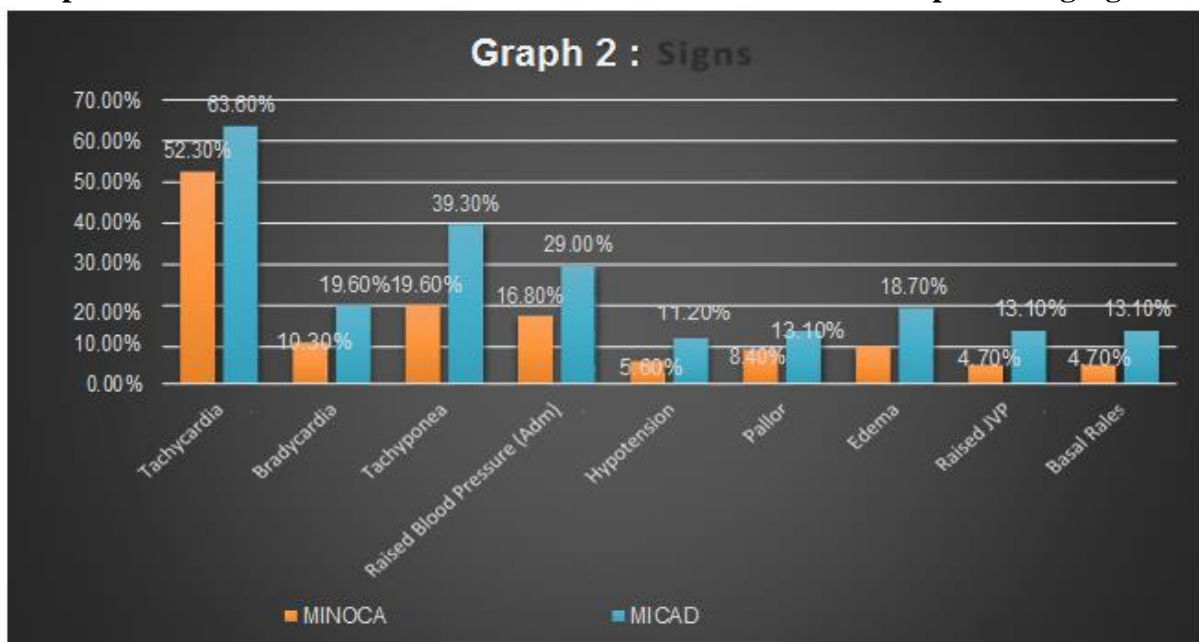


Chest pain was the most common presenting symptom among patients with MINOCA (70.1%) and Ghabrahat (83.2%) was the most common presenting symptom among patients with MICAD. Patients with MINOCA more commonly presents with atypical complaints (37.4%vs15.9%) whereas Symptoms such as Breathlessness (9.3%vs29.9% $p=0.000$), ghabrahat (30.8%vs83.2% $p=0.000$) and sweating (36,4% vs 60.7% $p=0.000$) were less commonly seen in patients with MINOCA as compared to patients with MICAD and the difference was statistically significant.

Table-2: Comparison between patients with MINOCA and MICAD based on Signs

SIGNS	MINOCA	MICAD	PValue ($p<0.05$ -significant)
Tachycardia	52.30%	63.60%	0.097
Bradycardia	10.30%	19.60%	0.055
Tachypnoea	19.60%	39.30%	0.002
Raised BP	16.80%	29.00%	0.034
Hypotension	5.60%	11.20%	0.139
Edema	9.30%	18.70%	0.049
Raised JVP	4.70%	13.10%	0.031
Basal Rales	4.70%	13.10%	0.031

Comparison between Patients with MINOCA and MICAD based on presenting signs



Tachycardia was the most common presenting sign in patient with MINOCA (52.3%) and patients with MICAD (63.6%). Signs such as Edema, tachypnoea, Raised Blood pressure at Admission, Basal rales and raised JVP (9.3%vs18.7% $p=0.049$, 19.6% vs 39.3% $p=0.002$, 16.8% vs 29% $p=0.034$, 4.7% vs 13.1% $p=0.031$, 4.7%vs13.1% $p=0.031$) respectively were less prevalent among patients with MINOCA as compared to patient with MICAD and the differences were statistically significant.

Signs such as tachycardia, bradycardia, hypotension were less prevalent when compared with patients with MICAD that were (52.3% vs 63.6%, 10.3% vs 19.6%, 5.6% vs 11.2%) respectively but the differences were not statistically significant.

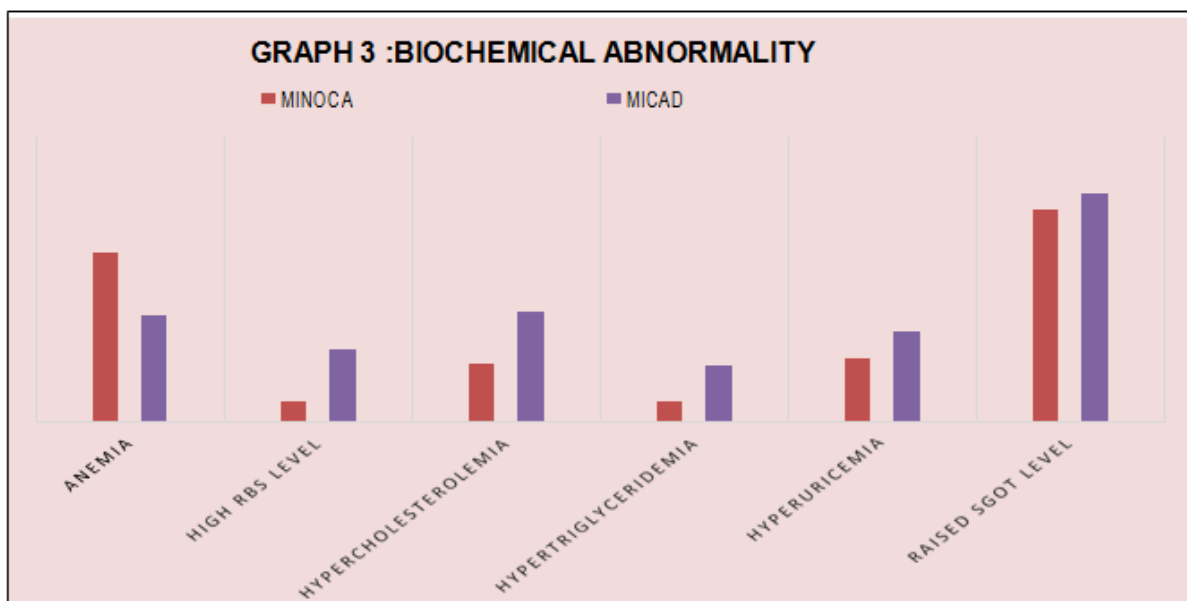
Table-3: Comparison between patients with MINOCA and MICAD based on Biochemical abnormalities

BIOCHEMICAL ABNORMALITIES	MINOCA	MICAD	PValue (p<0.05-significant)
Anemia	71.00%	44.90%	0.000
High RBS level	8.40%	30.80%	0.000
Hypercholesterolemia	24.30%	46.70%	0.001
Hypertriglyceridemia	8.40%	23.40%	0.003
Hyperuricemia	27.10%	38.30%	0.080
Raised SGOT Level	89.70%	96.30%	0.061

Table-4: Comparison between patients with MINOCA and MICAD based on Biochemical parameters.

BIOCHEMICAL PARAMETER	MINOCA	MICAD	PValue (p<0.05-significant)
Mean Hemoglobin	12.57 ±1.31 g/dl	12.98±1.72g/dl	0.000
Mean RBS	151.9±34.64mg/dl	168.74±70.66mg/dl	0.000
Mean cholesterol	208.62±75.8mg/dl	236.18±46.07mg/dl	0.001
Mean Triglycerides	96.33±35.764mg/dl	175.36±31.119mg/dl	0.003
Mean Uric acid	4.69 ± 1.69mg/dl	6.35±2.04mg/dl	0.080
Mean SGOT	56.5±28.92U/L	71.27 ±32.50U/L	0.061

Comparison between Patients with MINOCA and MICAD based on Biochemical Abnormalities



Biochemical Abnormalities like High random blood sugar levels (8.4% vs 30.8%), hypercholesterolemia (24.3% vs 46.70%) and hypertriglyceridemia (8.40% vs 23.40%) were less prevalent whereas reduced haemoglobin levels or Anaemia (71% vs 44.9%) was more prevalent among patients with MINOCA as compared to patients with MICAD. There was no significant difference in prevalence of patients with hyperuricemia (27.1% vs 38.3%) and raised SGOT levels (89.7% vs 96.3%) respectively in both groups.

DISCUSSION

Chest pain was the most common presenting symptom among patients with MINOCA (70.1%) and Ghabrahat (83.2%) was the most common presenting symptom among patients with MICAD. Patients with MINOCA more commonly presents with atypical complaints such as atypical chest pain, nausea, dizziness etc (37.4% vs 15.9%) whereas Symptoms such as Breathlessness (9.3% vs 29.9% $p=0.000$), ghabrahat (30.8% vs 83.2% $p=0.000$) and sweating (36.4% vs 60.7% $p=0.000$) were less commonly seen in patients with MINOCA as compared to patients with MICAD and the difference was statistically significant. In the study by **Gasior P et al**¹² chest pain/angina was the most common symptom in both groups, however it was less pronounced in the patients with MINOCA (88.32% vs 94.24%) as compared to patients with MICAD. In the study by **Safdar B et al**¹³ Breathlessness was significantly more common among patients with MINOCA (5.76%) as compared to patients with MICAD (2.38%)

In our study the most common presenting sign among patients with MINOCA was tachycardia which was observed in (52.3%) of cases followed by tachypnoea which was seen in (19.6%) of cases. Signs such as Raised Blood pressure at Admission, bradycardia, hypotension, Basal rales and Raised JVP were found in (16.8% > 10.3% > 5.6% > 4.7% and 4.7%) cases in decreasing order of prevalence respectively. Tachycardia was the most common presenting sign in patient with MINOCA (52.3%) and patients with MICAD (63.6%). Signs such as Edema, tachypnoea, Raised Blood pressure at Admission, Basal rales and raised JVP (9.3% vs 18.7% $p=0.049$, 19.6% vs 39.3% $p=0.002$, 16.8% vs 29% $p=0.034$, 4.7% vs 13.1% $p=0.031$, 4.7% vs 13.1% $p=0.031$) Respectively were less prevalent among patients with MINOCA as compared to patient with MICAD and the differences were statistically significant.

Signs such as tachycardia, bradycardia and hypotension were less prevalent when compared with patients with MICAD that were (52.3% vs 63.6%, 10.3% vs 19.6%, 5.6% vs 11.2%) respectively but the differences were not statistically significant.

Symptoms and signs of heart failure such as breathlessness, tachypnoea, bipedal edema, basal rales and raised JVP were less prevalent among patients with MINOCA in comparison to the patients with MICAD.

In our study the mean haemoglobin level of patients with MINOCA was 12.57 ± 1.31 g/dl which was lower than the mean haemoglobin level of patients with MICAD 12.98 ± 1.72 g/dl and the difference was statistically significant ($p=0.00$). Findings observed in the study by **Kilic S et al**¹⁴ in which mean haemoglobin level was (13.4 ± 2.1 g/dl vs 13.6 ± 1.9 g/dl) in patients with MINOCA and MICAD respectively where difference was statistically insignificant. In our study the prevalence of patients with reduced haemoglobin levels/Anemia (<13 gm/dl for

men and $<12\text{gm/dl}$ for females) was significantly higher among patients with MINOCA(71%) as compared to patients with MICAD(44.9%) and the difference was statistically significant($p=0.00$).

We observed that the average random blood sugar levels in patients with MINOCA was $151.9\pm 34.64\text{mg/dl}$ which was lower than average random blood sugar level of patients with MICAD $168.74\pm 70.66\text{mg/dl}$ and the difference was statistically significant($p=0.00$). Our findings were in line with study by **Salih K et al**¹⁴ where average random blood sugar level in patient with MINOCA was 111mg/dl which was lower than average random blood sugar level of patients with MICAD that was 124 mg/dl and the difference was statistically significant. In our study the prevalence of Patients with High random blood sugar levels ($>200\text{mg/dl}$) was significantly lower among patients with MINOCA(8.4%) in comparison to patients with MICAD(30.8%).

We found that the mean total cholesterol levels in patients with MINOCA was $208.62\pm 75.81\text{mg/dl}$ which was lower than mean total cholesterol levels of patient with MICAD that was $236.18\pm 46.07\text{mg/dl}$ and the difference was statistically significant($p=0.001$). Observation made by **Jamil S et al**¹⁵ found no significant difference in mean total cholesterol levels ($174\pm 54.14\text{mg/dl}$ vs $185\pm 42.54\text{ mg/dl}$) in patients with MINOCA and MICAD respectively. In our study the prevalence of patients with high total cholesterol ($>240\text{mg/dl}$) levels/hypercholesterolemia was significantly lower among patients with MINOCA (24.3%) as compared to patients with MICAD(46.7%) ($p=0.001$). Similar findings were observed by **Gasior P et al**¹² in which the prevalence of patients with high total cholesterol/hypercholesterolemia levels was significantly lower among patients with MINOCA 35.85% as compared to patients with MICAD 44.19%.

In our study the mean total triglyceride levels in patients with MINOCA was $96.33\pm 35.764\text{mg/dl}$ which was lower than the mean total triglyceride levels of patients with MICAD which was $175.36\pm 31.119\text{mg/dl}$.

Similar observations were made by **Jamil S et al**¹⁵, they also found that mean total Triglyceride levels among patients with MINOCA was $124\pm 79.72\text{mg/dl}$ which was lower than the patients with MICAD which was $150\pm 88.57\text{mg/dl}$. In our study the prevalence of patients with hypertriglyceridemia was significantly lower among patients with MINOCA(8.4%) as compared to patients with MICAD (23.4%) ($p=0.003$).

The average serum uric acid levels of patients with MINOCA was $4.69 \pm 1.69\text{mg/dl}$ which was lower than the patients with MICAD that was $6.35\pm 2.04\text{mg/dl}$ and the difference was statistically insignificant ($p=0.080$). Hyperuricemia is prevalent similarly ($>6\text{mg/dl}$ in female and $>7\text{mg/dl}$ in male) among patients with MINOCA and MICAD (27.1% vs 38.3%) respectively. In the study by **AzmatEhsan Qureshi et al**¹⁶ hyperuricemia was associated with more frequent total occlusions and critical lesions in men presenting with Myocardial infarction. In the study by **Ekici B et al**¹⁷ Hyperuricemia was less common in patients with MINOCA as compared to patients with MICAD.

In our study the mean serum SGOT(AST) level among patients with MINOCA was $56.5\pm 28.92\text{U/L}$ which was lower than the mean serum SGOT levels of patients with MICAD that was $71.27 \pm 32.50\text{U/L}$ and the difference was statistically insignificant($p=0.061$). Raised SGOT ($>35\text{IU/L}$) levels are similarly prevalent among patients with MINOCA and MICAD respectively (89.7% vs 96.3%).

CONCLUSION

Patients with MINOCA most commonly presents with chest pain. Atypical complaints were more common whereas symptoms and signs of heart failure were less common among patients with MINOCA as compared to patients with MICAD. Biochemical Abnormalities like High random blood sugar levels, hypercholesterolemia and hypertriglyceridemia were less prevalent whereas reduced hemoglobin levels (Anemia) was more prevalent among patients with MINOCA as compared to patients with MICAD. Raised SGOT levels and Hyperuricemia were similarly prevalent among patients with MINOCA and MICAD.

REFERENCES

1. Pasupathy, S, Air, T, Dreyer, RP, Tavella, R, Beltrame, JF. Systematic review of patients presenting with suspected myocardial infarction and nonobstructive coronary arteries [published correction appears in *Circulation*. 2015;131:e475]. *Circulation*.2015;131:861–870.
2. Barr, PR, Harrison, W, Smyth, D, Flynn, C, Lee, M, Kerr, AJ. Myocardial infarction without obstructive coronary artery disease is not a benign condition (ANZACS-QI 10). *Heart Lung Circ*. 2018;27:165– 174.
3. Lindahl, B, Baron, T, Erlinge, D, Hadziosmanovic, N, Nordenskjöld, A, Gard, A, Jernberg, T. Medical therapy for secondary prevention and long-term outcome in patients with myocardial infarction with nonobstructive coronary artery disease. *Circulation*. 2017;135:1481– 1489.
4. Safdar, B, Spatz, ES, Dreyer, RP, Beltrame, JF, Lichtman, JH, Spertus, JA, Reynolds, HR, Geda, M, Bueno, H, Dziura, JD, Krumholz, HM, D'Onofrio, G. Presentation, clinical profile, and prognosis of young patients with myocardial infarction with nonobstructive coronary arteries (MINOCA): results from the VIRGO study. *J Am Heart Assoc*. 2018;7:e009174.
5. Daniel, M, Agewall, S, Caidahl, K, Collste, O, Ekenbäck, C, Frick, M, Y-Hassan, S, Henareh, L, Jernberg, T, Malmqvist, K, Schenck- Gustafsson, K, Sörensson, P, Sundin, Ö, Hofman-Bang, C, Tornvall, P. Effect of myocardial infarction with nonobstructive coronary arteries on physical capacity and quality-of-life. *Am J Cardiol*.2017;120:341– 346.
6. Kemp HG, Kronmal RA, Vliestra RE, Frye RL. Seven years survival of patients with normal or near normal coronary arteriograms: a CASS registry study. *J Am CollCardiol*1986;7:479-83.
7. Greenberg MA, Grose RM, Neuburger N, Silverman R, Strain JE, Cohen MV. Impaired coronary vasodilator responsiveness as a cause of lactate production during pacing-induced ischaemia in patients with angina pectoris and normal coronary arteries. *J Am CollCardiol*1987;9:743-51.
8. Alpert JS. Myocardial infarction with angiographically normal coronary arteries. *Arch Intern Med* 1996;154:265-9.
9. Da Costa A, Isaaz K, Faure E, Mourot S, Cerisier A, Lamaud M. Clinical characteristics, aetiological factors and long-term prognosis of myocardial infarction with an absolutely normal coronary angiogram: a 3-year follow-up study of 91 patients. *Eur Heart*

J2001;22:1459-65.

10. Bugiardini R, Bairey Merz CN. Angina with—normal coronary arteries: a changing philosophy. *JAMA* 2005;293:477-84.
11. Thygesen K, Alpert JS, White HD. Universal definition of myocardial infarction. *Eur Heart J* 2007;28:2525-38.
12. Gąsior P, Desperak P, Gierlaszyńska K, Hawranek M, Gierlotka M, Gąsior M, Poloński L. Percutaneous coronary intervention in treatment of multivessel coronary artery disease in patients with non-ST-segment elevation acute coronary syndrome. *Postępy Kardiologii Interwencyjnej*. 2013;9(2):136-45.
13. Basmah Safdar, Erica S. Spatz, Rachel P. Dreyer, John F. Beltrame et al. Presentation, Clinical Profile, and Prognosis of Young Patients With Myocardial Infarction With Nonobstructive Coronary Arteries (MINOCA): Results From the VIRGO Study. *J Am Heart Assoc*. 2018;7:e009174.
14. Kilic S, Aydın G, Çoner A, et al. Prevalence and clinical profile of patients with myocardial infarction with non-obstructive coronary arteries in Turkey (MINOCA-TR): A national multi-center, observational study. *Anatol J Cardiol*. 2020;23(3):176-182.
15. Sarah Jamil, Gohar Jamil, Hanaa Mesameh, Anwer Qureshi Juma AlKaabi. Risk factor comparison in young patients presenting with acute coronary syndrome with atherosclerotic coronary artery disease vs. angiographically normal coronaries. *Int. J. Med. Sci*. 2021;18:3526-32
16. Azmat Ehsan Qureshi et al. Sci. Relationship of serum uric Acid level and angiographic severity of coronary artery disease in male patients with acute coronary syndrome; *Pak J Med*, 2013 Sep;29(5):1137-41.
17. Ekici B, Kütük U, Alhan A, Töre HF. The relationship between serum uric acid levels and angiographic severity of coronary heart disease. *Kardiolog Pol*. 2015;73(7):533-8.
18. Ciliberti G, Compagnucci P, Urbinati A, Bianco F, Stronati G, Lattanzi S, Dello Russo A, Guerra F. Myocardial Infarction Without Obstructive Coronary Artery Disease (MINOCA): A Practical Guide for Clinicians. *Curr Probl Cardiol*. 2021 Mar;46(3):100761. doi: 10.1016/j.cpcardiol.2020.100761. Epub 2020 Dec 10. PMID: 33360675.