

**Assessment of Risk Factors and Clinical Features in Young Patients with Myocardial Infarction: A Cross-Sectional Study****Ravi Ranjan Kumar Raman<sup>1</sup>, Vikash Kumar<sup>2</sup>, Md. Shahid<sup>3</sup>, Sumit Kumar<sup>4</sup>**<sup>1</sup>Senior Resident, Department of General Medicine, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India<sup>2</sup>Senior Resident, Department of General Medicine, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India<sup>3</sup>Senior Resident, Department of General Medicine, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India<sup>4</sup>Assistant Professor & Head of Department, Department of General Medicine, Government Medical College and Hospital, Bettiah, Bihar, India

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Conflict of interest: Nil

**Abstract:****Background:** The change in life style is one of the important risk factors for development of obesity, along with its consequences such as development of metabolic syndrome, hypertension and diabetes mellitus, and coronary artery disease.**Aims and Objectives:** The aims of this study were to study the risk factors and clinical profiles of young patients with acute myocardial infarction.**Materials and Methods:** The present cross-sectional study was conducted on Ninety (young patients (<45 years of age) admitted to the emergency department of the internal medicine and diagnosed with MI. The diagnosis of MI was done primarily on the basis of an electrocardiogram (ECG). For statistical analysis, and data interpretation, Microsoft Excel 15 and SSPS22.0 software was used, and P<0.05 was taken as statistically significant.**Result:** The present study consists of 90 patients. Out of these, there were 70 males and 20 females with a M: F ratio being 3.5:1. The overall mean age of young patients with MI in this study was found to be 36.90±4.86 years. The analysis of risk factors for showed that body mass index was 30.93 Kg/m<sup>2</sup>. 58.89% patients were active smokers, whereas 41.11% patients had no history of smoking. In 20% patients both parents had history of CAD, whereas in 42.22% patients, one parent had history of CAD. Hypertension and DM was present in 54.44% and 35.55% respectively. Dyslipidaemia was the most common risk factor in the present study was in 75.56% patients. The majority of patients had STEMI, accounting for 67.78% of the total, while the rest 32.22% suffered from NSTEMI. **Conclusion:** In present study, Acute MI in people less than 45 years of age is almost exclusively seen in men, and ST elevation MI is the main presentation. Smoking, hypertension, Diabetes Mellitus, low HDL, high triglycerides, and raised Lp(a) are major risk factors. Anterior wall MI is more common, and in hospitals admitting patients, mortality is low.**Keywords:** Coronary artery disease, myocardial infarction, Diabetes Mellitus, risk factorsThis is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.**Introduction**

The change in life style is one of the important risk factors for development of obesity, along with its consequences such as development of metabolic syndrome, hypertension and diabetes mellitus, and coronary artery disease (CAD) [1]. Young patients with CAD are specific subset of population requiring attention. In addition, young patients have different risk factor profiles and prognosis than older patients [2]. Although commonly seen in elderly individuals, are now being increasingly recognized in a relatively young age group (<45 years)[3].

Increasing incidence of CAD in young individuals may have a devastating effect not only on the health of individuals but also families, as young individuals suffering from myocardial infarction (MI) may have to make substantial changes in lifestyle, which may have enormous financial implications. Other than financial implications, myocardial disease in young individuals may have psychological issues that are relatively less common in older individuals [4]. The conventional risk factors for CAD such as smoking, obesity, dyslipidemia, hypertension, diabetes,

insulin resistance, and metabolic syndrome, which predispose elderly individuals to the development of CAD, are also important risk factors even in young adults [5]. The strongest genetic factor associated with increased risk of MI is identified on chromosome 9p21.3 [6]. Advancing age is a well-recognized risk factor for acute myocardial infarction (AMI). Studies show a 2–10% incidence of AMI in patients age 45 or younger [7]. Young individuals may not only have different risk factors but also a strikingly different presentation from older individuals. While older individuals may have a typical history of gradually worsening symptoms of angina for years culminating finally in MI, young individuals with MI are more likely to present with their first episode of angina developing MI [8].

### Aims and Objectives

The aims of this study were to study the risk factors and clinical profiles of young patients with acute myocardial infarction.

### Materials and Methods

The present cross-sectional prospective study was conducted in the Department of General Medicine at the Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India. Ninety (90) young patients (<45 years of age) admitted to the emergency department of the internal medicine and diagnosed with MI were included in this study on the basis of predefined inclusion and exclusion criteria. A written informed consent was obtained from patients to be part of this study. The Institutional Ethical Committee approved the study. The duration of the study was November 2022 to April 2023.

### Inclusion Criteria

The following criteria were included in the study:

- a. Patients who gave informed and written consent to be part of the study
- b. Patients older than 18 years and younger than 45 years of age who presented with complaints of chest pain, palpitation, breathlessness, or a combination of these were subjected primarily to electrocardiographic studies to confirm myocardial infarction.
- c. All patients with ST segment elevation (>1 mm in inferior-oriented leads or >2 mm in anterior-oriented leads) in at least two consecutive leads were considered to have myocardial infarction.

### Exclusion Criteria

The following criteria were excluded from the study:

- a. Those who refused to give consent
- b. Age <18 years or above 45 years
- c. Patients with co morbidity cardiac conditions such as rheumatic valvular heart disease and congenital heart diseases

The diagnosis of MI was done primarily on the basis of an electrocardiogram (ECG). The presence of tall, symmetrical, peaked, and widened T waves, slope elevation of the ST segment, increased amplitude of the R wave, changes in the terminal QRS complex for ST segment elevated MI, and ST segment depression and T wave inversion with positive troponin I/T for non-ST elevation MI (NSTEMI) were taken as diagnostic of MI for the purpose of the study. A thorough history was taken, including demographic details, occupation, and socioeconomic status of the patients. Particular attention was given to finding out the family history of CAD, hypertension, and diabetes mellitus. The presence of risk factors in patients such as type of lifestyle, personality, history of smoking, obesity, hypertension, diabetes mellitus, and hyperlipidemia was reviewed and documented. If any risk factor was present, then the duration of the presence of such a factor was determined by history. Body mass index of all the patients was determined. The history of presenting complaints, including the history and duration of chest pain, was determined by history. Basic investigations such as a complete blood count, hepatic and renal function tests, fasting and postprandial blood sugar levels, a lipid profile, and urine examination were performed in all cases. ECG and echocardiography were also done in all cases. Vitals parameters such as pulse rate, respiratory rate, and blood pressure were recorded. A detailed cardiovascular examination was done with a view to determining whether heart sounds were normal. The presence of any additional sounds such as murmurs, ejection clicks, gallops, or pericardial friction rubs was looked for.

### Sample size determination

Keeping power (1-  $\beta$  error) at 80% and confidence interval (1-  $\alpha$  error) at 95%, the minimum sample size required in each group was 50 patients; therefore, we included 90 patients (more than the minimum required number of patients) in this study.

### Statistical Analysis

The data regarding presenting complaints as well as the presence of risk factors were analyzed. For statistical analysis, and data interpretation, Microsoft Excel 15 and SPSS 22.0 software was used, and  $P < 0.05$  was taken as statistically significant. The groups were compared for all variables using the Student's t test to compare equality for means. The results are presented as percentages and mean  $\pm$  SD.

### Result

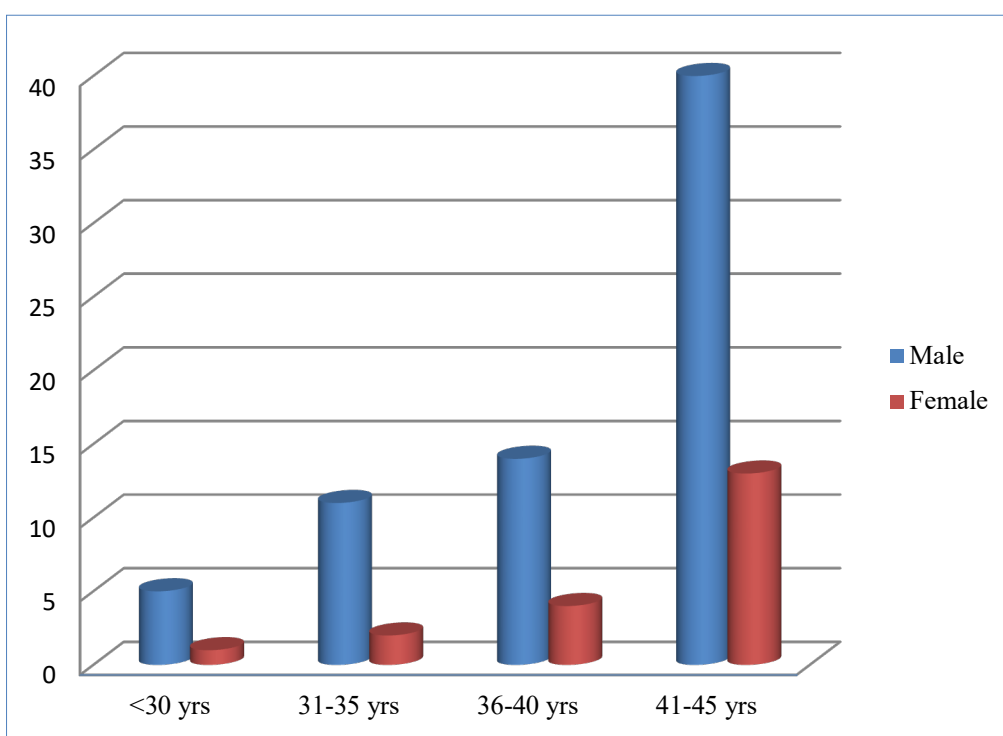
The present prospective cross-sectional study consists of 90 patients. Out of these, there were 70 (77.78%) males and 20 (22.23%) females with a M:F ratio being 3.5:1. The overall mean age of young patients with MI in this study was found to be  $36.90 \pm 4.86$  years. The analysis of the patient on the basis of age at presentations showed that the most

common age group at the time of the first presentation was above 40 years (58.90%), followed by 36–40 years (19.99%), and 31–35 years (14.44%). Only six patients (6.67%) presented before 30 years of

age. The mean age of male as well as female patients was found to be comparable with a statistically significant difference (P = 0.20) (Table 1, Figure1).

**Table 1: Age distribution of the patients**

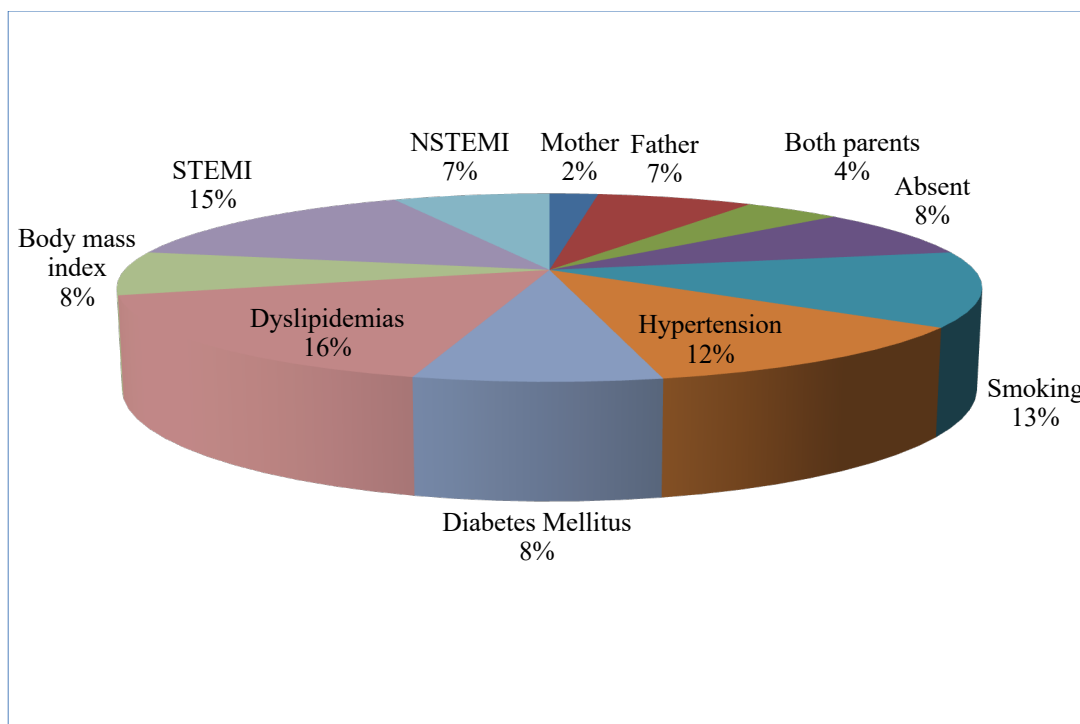
Age (In years)	Number of patients (%)	
	Male	Female
Mean age	39.50±5.92	40.52±4.83
<30	5(5.56%)	1(1.11%)
31-35	11(12.22%)	2(2.22%)
36-40	14(15.55%)	4(4.44%)
41-45	40(44.45%)	13(14.45%)
Total	70(77.78%)	20(22.22%)
P value=0.20 (Not significant)		



**Figure 1: Age distribution of the patients**

**Table 2: Risk factors associated with patients**

Risk factors	Number of patients (%)
Family history of CAD	
Mother	9(10%)
Father	29(32.22%)
Both parents	18(20%)
Absent	34(37.78%)
Smoking	53(58.89%)
Hypertension	49(54.44%)
Diabetes Mellitus	32(35.55%)
Dyslipidemias	68(75.56%)
Body mass index (Mean ± SD) in Kg/m <sup>2</sup>	30.93±8.63
STEMI	61(67.78%)
NSTEMI	29(32.22%)



**Figure 2: Risk factors associated with patients (%)**

The analysis of risk factors for showed that body mass index was 30.93 Kg/m<sup>2</sup>. Fifty three (58.89%) patients were active smokers, whereas 43(41.11%) patients had no history of smoking. In 18 (20%) patients both parents had history of CAD, whereas in 38 (42.22%) patients, one parent had history of

CAD. Hypertension and DM was present in 49(54.44%) and 32 (35.55%) respectively. Dyslipidaemia was the most common risk factor in the present study was in 68 (75.56%) patients. The majority of patients had STEMI, accounting for 61 (67.78%) of the total, while the rest 29 (32.22%) suffered from NSTEMI (Table 2 & Figure 2).

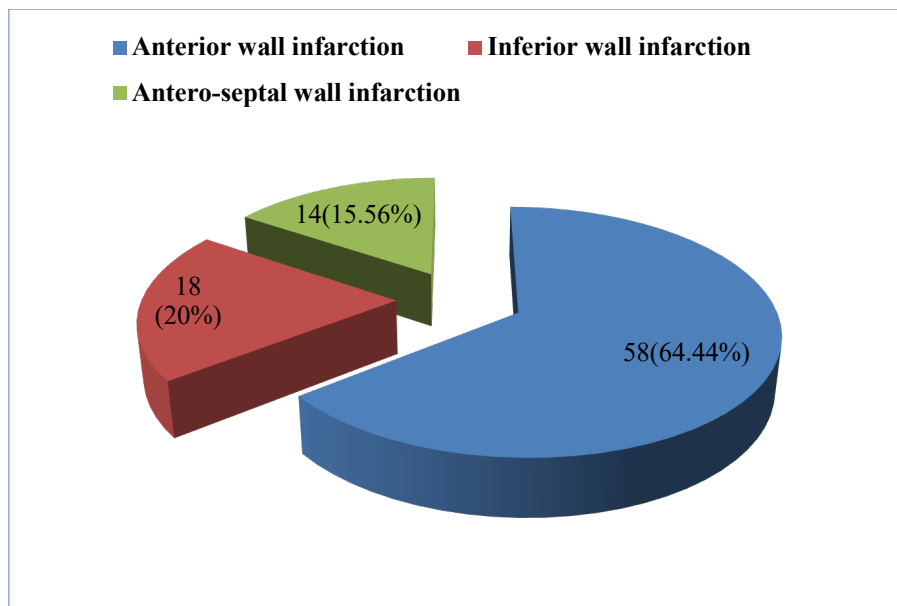
**Table 3: Laboratory findings**

Parameters	Mean ± SD
Haemoglobin(g/dl)	14.43 ±1.22
Platelets	295.86 ±86.12
Creatinine(mcmol/l)	71.36±12.59
Urea	3.86 ±1.51
Total Cholesterol(mg/dl)	4.79 ±1.7
LDL Cholesterol(mg/dl)	3.14 ±1.51
Triglycerides(mg/dl)	2.21 ±1.57
Peak CPK(U/L)	1526.71 ±22.01
Peak CPK-MB(U/L)	172.71 ±256.36
Peak Troponin I(ng/ml)	53.14 ±87.23

The mean complete blood count, kidney function tests were normal, with a slightly elevated lipid profile. Peak CPK and Troponin I was elevated due to the myocardial infarction. CPK- MB elevation alone appear warranted to establish the diagnosis of an acute myocardial infarction.

**Table 4: Site of myocardial infarction**

Type of myocardial infarction	Number of patients (%)
Anterior wall infarction	58(64.44%)
Inferior wall infarction	18(20%)
Antero-septal wall infarction	14(15.56%)

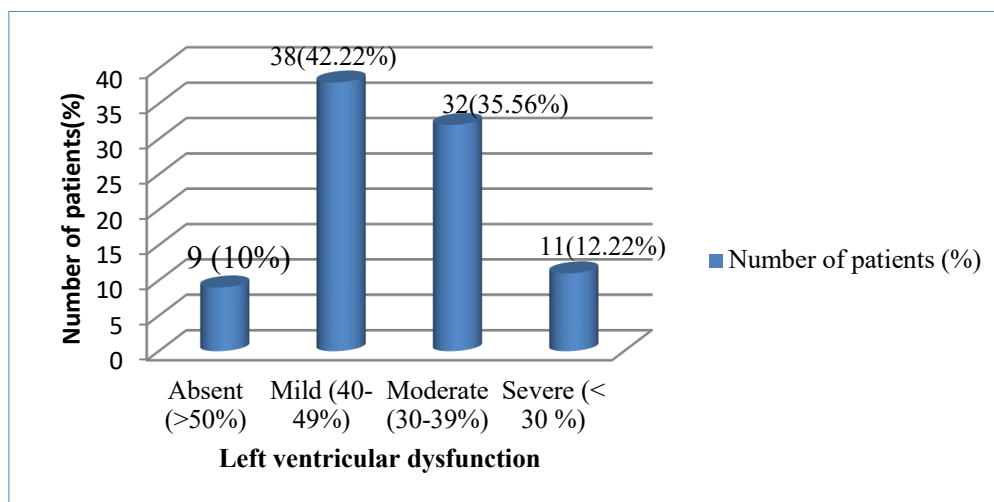


**Figure 3: Site of myocardial infarction**

The analysis of patients on the basis of site of MI showed that in most of the patients 58 (64.44%), there was anterior wall infarction. Inferior wall infarction and antero-septal MI were seen in 18 (20%) and 14 (15.56%) patients respectively (Table 4 & Figure 3).

**Table 5: Severity of left ventricular dysfunction**

left ventricular dysfunction	Number of patients (%)
Absent (>50%)	9 (10%)
Mild (40-49%)	38 (42.22%)
Moderate (30-39%)	32(35.56%)
Severe (<30%)	11(12.22%)



**Figure 4: Severity of left ventricular dysfunction**

Assessment of the left ventricular function showed that in 38 (42.22%) patients that there was mild left ventricular dysfunction, whereas moderate ventricular dysfunction was seen in 32(35.56%) patients. In 11(12.22%), severe systolic dysfunction was seen (Table 5 & Figure 4).

**Discussion**

With the increasing prevalence of sedentary life-styles and their consequences such as obesity,

metabolic syndrome, hypertension, and diabetes mellitus occurring in young individuals, there is a significant rise in the incidence of MI at a relatively young age (below 45 years). In our study of 90

young patients (below 45 years of age) admitted with MI, there was a male preponderance with M:F ratio being 3.5:1.

In our study of 90 young patients admitted with MI who are aged between 18 and 45 years and meet other eligibility criteria for the assessment of modifiable and non-modifiable risk factors in Bettiah, West Champaran, Bihar, India. The youngest patient was a male, 24 years old. Most of the events in both sexes occurred in the late 4th decade, i.e., the overall mean age of young patients with MI in this study was found to be  $36.90 \pm 4.86$  years. Similar age distribution was also reported by the authors, such as Akram V M et al., [9] and Deora et al., [10].

There was a male preponderance in the present study with M:F ratio being 3.5:1, and the same observation was reported in cases of MI in young patients by Akram V M et al., [9] (5.25:1), Dwiwedi et al., [11] in 2000 (4:1), and Dani et al., [12] in 2003 (4.55:1).

The prevalence of smoking is about 58.89% in the present study, which correlates with the Indian studies, i.e., 56% in Akram V. M. et al. [9], and 60% in Dani et al. [12] in 2003. However, a western study by Donald A. Underwood et al. [13] showed a much higher prevalence (83.9%). Conti et al. conducted a study of MI in young patients [14]. The authors retrospectively studied 236 patients with acute MI. The authors assessed risk factors, including the treatment used, the pattern of coronary artery obstruction, left ventricular ejection fraction, and complications. The authors reported that out of 236 patients, there were 182 males and 54 females, with a M:F ratio of 1:0.29. Other studies, such as those conducted by Sinha et al. [15] and Maas and Appelman [16], also reported a male preponderance in cases of MI in young patients. In our study, the mean age of male patients was found to be  $39.50 \pm 5.92$  years, whereas the mean age of female patients was found to be  $40.52 \pm 4.83$  years. The mean of male as well as female patients was found to be comparable, with no statistically significant difference. Shah and Jain conducted a study to analyse the clinical profile of acute MI in young adults [17]. In our study, obesity, family history of CAD, hypercholesterolemia, smoking, diabetes, and hypertension were significant risk factors seen in young patients with MI. Bhardwaj et al. conducted a prospective study of 124 consecutive patients presenting with MI at <40 years of age were studied for risk factors [18].

The analysis of risk factors showed that the body mass index was  $30.93 \text{ Kg/m}^2$ . In 62.22% of patients, a family history of CAD, hypertension, or DM was present in 54.44% and 35.55%, respectively. Dyslipidemia was the most common risk factor in the present study in 75.56% of patients. The findings of this study were similar to ours in respect to other risk factors for the development of MI in young

adults. Similar risk factors were also reported by the authors such as Nadeem et al., [19] and Wahren-bergetal [20].

The majority of patients had STEMI, accounting for 61 (67.78%) of the total, while the rest suffered from NSTEMI. Anterior wall infarction was the most common type of infarction in our study, followed by inferior wall infarction and anteroseptal infarction. The majority of these patients with MI had either mild (42.22%), moderate (35.56%), or severe (12.22%) systolic dysfunction as assessed by 2D Echo. Deshmukh et al. conducted a study of young patients who presented with MI [21].

A high prevalence of diabetes mellitus of 35.55% was noted in the present study, which is approximately triple that of the study groups (11.9% in a study by P. Jit. Singh et al., [22]).

#### Limitations of the study

The current study was retrospective and had a small sample size. Due to retrospective studies, their validity can be challenged, particularly regarding information like smoking, HTN, DM, food habits, etc. Although the strongest genetic factor associated with increased risk of MI is identified on chromosome 9p21.3, we could not analyze this in our study.

#### Conclusion

In present study, Acute MI in people less than 45 years of age is almost exclusively seen in men, and ST elevation MI is the main presentation. Smoking, hypertension, Diabetes Mellitus, low HDL, high triglycerides, and raised Lp(a) are major risk factors. Anterior wall MI is more common, and in hospitals admitting patients, mortality is low.

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Ravi Ranjan Kumar Raman gave concept and idea, study design, and manuscript drafting data collection and analysis; Vikash Kumar and Md. Shahid gave data collection and analysis, manuscript revision, and data interpretation. We would like to acknowledge the support extended by Sumit Kumar, head of department, Department of General Medicine, Government Medical College and Hospital, Bettiah, West Champaran, Bihar, India, for their valuable support in undertaking this study.

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