



Case Study: Determination of Incidence of Hyperuricemia among Patients Suffering from Acute Coronary Artery Syndrome

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Abstract

In the vast majority of nations across the globe, coronary artery disease (CAD) remains the leading cause of mortality. It is among the most widely recognized global health concerns affecting both sexes. The worldwide impact of CAD is severe, and its consequences are particularly pronounced in countries with higher incidence rates. In Western nations, myocardial infarction outcomes are often linked to socioeconomic status, with those in lower socioeconomic positions disproportionately affected by the burden of this disease. Given the high rates of morbidity and mortality associated with acute myocardial infarction (MI), this condition continues to be a major focus of cardiovascular therapy. The present study sheds new light on the issue, as the findings differ from previous research due to demographic, nutritional, and lifestyle differences. The dissemination of these findings to the medical community will be critical to informing future research and better understanding how to recognize and treat hyperuricemia in ACS patients. This study has important implications for public health policy and clinical practice. By improving our understanding of the complex interplay between socioeconomic factors and cardiovascular health, we can develop more targeted interventions and improve outcomes for those at the highest risk of CAD and related conditions. This study was performed at the Cardiology Department of Khyber Teaching Hospital, Peshawar for six months, from 19th July 2022 to 19th January 2023. It was a cross-sectional study in which 360 male and female patients aged between 30-60 years were included with acute coronary syndrome. Clinical history, physical examination, and laboratory investigations, including troponin test and ECG results, were adequately monitored. At the time of admission, all patients' blood samples were collected and biochemically analyzed to determine serum uric acid (SUA) levels at Khyber Teaching Hospital. Men with uric acid levels over 7 mg/dl and women with uric acid levels exceeding 6 mg/dl have hyperuricemia. This study reveals a mean age of 52 years with a SD ± 11.74 . 63 % of patients were male, and 37% were female. Moreover, 35% of patients had hyperuricemia, and 65% didn't. Our study concludes that the frequency of hyperuricemia was 35% in patients presenting with acute coronary syndrome to the Cardiology Department of Khyber Teaching Hospital, Peshawar.

Keywords Hyperuricemia, Acute Coronary Syndrome, Myocardial Infarction, Uric Acid

1. Introduction

The coronary artery is a serious issue affecting both males and females worldwide, in both developed and

developing countries (1, 2). The socioeconomic situation and outcome of myocardial infarction are well reported in the western part of the world, indicating that low socio-economic levels experience a high burden of

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this condition (3). Acute myocardial infarction related to cardiovascular therapeutics potentiates mortality and morbidity (4). To promote optimal treatment and provision of all components of MI therapy, the public sector at the local, regional, and national levels publishes 30-day mortality and hospital readmissions related to acute MI (5). The prevalence rate of CAD is high across South Asia, including Pakistan. It is estimated that approximately 100,000 people will suffer from acute MI in Pakistan by 2025 (2, 6, 7). Uric acid is an ultimate product produced by the metabolism of purines. The action of the enzyme xanthine oxidase produces it. Xanthine oxidase produces oxidants that may participate in the pathology of cardiovascular disorders (8-10). Uric acid is also responsible for predicting renal disorder induction of str. According to an AA-analysis, clinical studies proved that serum uric acid (SUA) is related to the incidence of cardiovascular disorders. A high level of SUA is linked to the occurrence and mortality of coronary artery diseases (11, 12). Uric acid is connected to the induction of intracellular stress and inflammation, which can lead to endothelial injury and increased vasoconstrictor effects (13, 14). More hyperuricemic individuals have been admitted to hospitals due to an increase in the incidence of left ventricular systolic and diastolic dysfunction during the last five years (15). Hence, such a study on the population provides the latest and most updated information on the frequency of hyperuricemia in patients presenting to the hospital with acute coronary artery syndrome (16). The results of this study can vary from other studies performed due to differences in demographic and lifestyle changes in eating habits. All the findings of this study will be shared with other health professionals for research purposes. This study will be helpful for the timely diagnosis of hyperuricemia in ACS and the effective treatment of the acute coronary syndrome.

2. Methodology

Setting Area: Cardiology Department, Khyber Teaching Hospital, Peshawar.

Study Design: Cross-sectional study.

Duration of Study: 6 months from 19th July 2022 to 19th January 2023.

Sample Size: In this study, 360 male and female patients aged between 30-60 years were included with the acute coronary syndrome. By taking 37.3% prevalence of hyperuricemia in acute coronary syndrome, 95% confidence interval, the margin of error

5%. The sample size was calculated using the WHO formula for sample size calculation.

Sampling Technique: Non-probability consecutive sampling.

Inclusion Criteria: All male and female patients presenting with their first acute coronary syndrome episode. All the patients were in the age range of 30 to 60 years.

Exclusion Criteria:

- Patients were taking lipid-lowering drugs.
- Patients were taking antihyperuricemic medicines for the treatment of gout.
- Patients who previously suffered from coronary artery disease as ECG changes might be persistent and contradictory for chronic and acute attacks.
- Patients with renal failure (an estimated glomerular filtration rate [e GFR] < 60 mL/min/1.73 m²).
- Patients with Hepatic failure on medical records and laboratory investigations.
- History of diuretics (especially thiazide) use.
- The conditions mentioned above, if included, may cause bias in the results of the study.

3. Procedure for Data Collection

The approval of an ethical committee of the hospital conducted this study. The patients who fulfilled the inclusion criteria in this current study visited the emergency outpatient department (OPD) hospital by accident and were admitted to the coronary care unit (CCU) for further evaluation. All the patients were enrolled after giving written consent. The patients were carefully monitored by taking their detailed history, clinical examination, and laboratory findings, including a troponin test and ECG evaluation. The vein puncture collected all patients' blood samples at admission, and the automated biochemical analyzer analyzed the blood samples to determine serum uric acid (SUA) levels at Khyber Teaching Hospital. Men with uric acid levels over 7 mg/dl and women with uric acid levels exceeding 6 mg/dl have hyperuricemia.

A predesigned Performa was designed and attached to each patient's medical record, including details such as age, gender, socio-economic status, professional status, and smoking status. The exclusion criteria were strictly followed to exclude the individuals who could distract the results of this study.

4. Data Analysis

Analysis of the data was performed by the SPSS (26 versions). The continuous variables, such as age and serum uric acid levels, were computed by the mean and standard deviation. The categorical variables such as gender, socio-economic status, occupation, smoking status, and hyperuricemia were calculated by frequency and percentages. Hyperuricemia was correlated with the effect of age, gender, socio-economic status, employment, and smoking. The chi-square test was applied in which a probability less than 0.05 was considered a significant value. The results are presented in the form of figures and tables.

5. Results

This study was conducted at the Cardiology Department, Khyber Teaching Hospital Peshawar, in which 360 patients were observed. Analysis of the results was performed as follows:

5.1. Age Distribution

Forty (11%) patients were in age between 30-40 years, 133 (37%) patients were in age between 41-50 years, and 187(52%) patients were in age between 51-60 years (Figure-1). The mean age was 52 years with SD \pm 11.74 (Table-1).

Table 1: Age distribution among the hyperuricemia patients.

Age (Years)	Frequency	Percentage (%)
30-40	40	11
41-50	133	37
51-60	187	52
Total	360	100 %

Mean Age= 52 years and SD= \pm 11.74

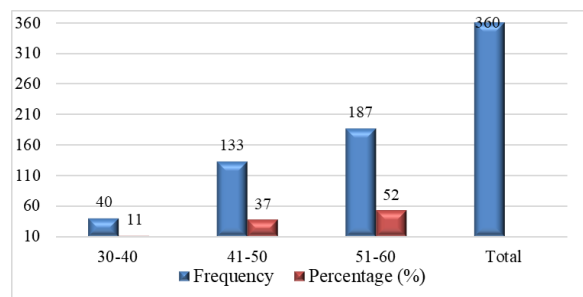


Figure 1: Age distribution among the hyperuricemia patients

5.2. Gender Distribution

Two hundred and twenty-seven (63%) patients were male, and 133(37%) patients were female, as shown in Figure-2 and Table-2.

Table 2: Gender distribution among the hypouricemic patients

Gender	Frequency	Percentage (%)
Male	227	63
Female	133	37
Total	360	100 %

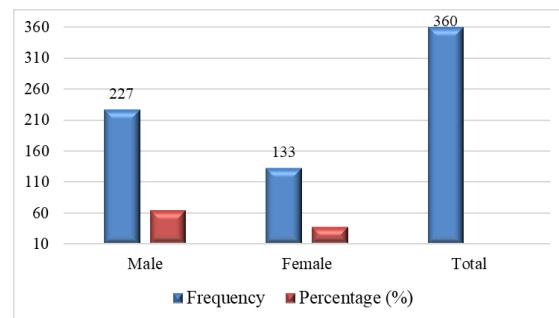


Figure 2: Gender distribution among the hyperuricemic patients.

5.3. Socio-economic Status

Sixty-eight (19%) patients were wealthy, 148 (41%) patients were middle class, and 144 (40%) patients were poor as shown in Figure-3 and Table-3.

Table 3: The Socio-economic status among the hyperuricemic individuals.

Socio-economic States	Frequency	Percentage (%)
Rich	68	19
Middle Class	148	41
Poor	144	40
Total	360	100 %

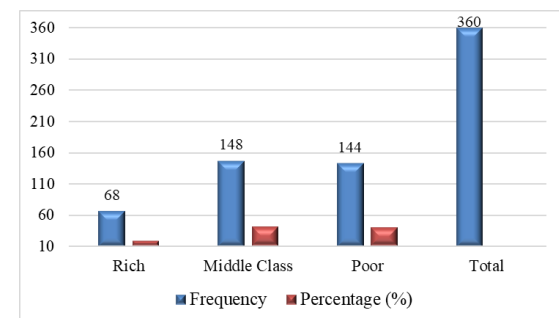


Figure 3: The Socio-economic status among the hyperuricemic individuals.

5.4. Occupation

Two hundred and twenty (61%) patients were employed, and 140 (39%) patients were unemployed as shown in Figure-4 and Table-4.

Table 4: The occupational status among the hyperuricemic individuals.

Occupation	Frequency	Percentage (%)
Employees	220	61
Un employees	140	39
Total	360	100 %

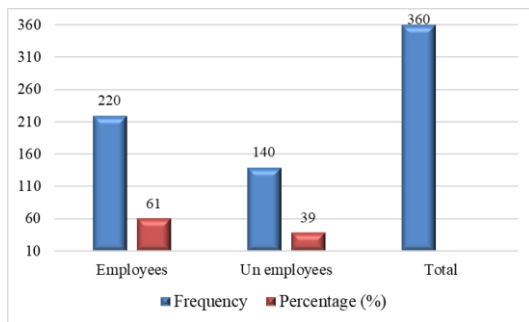


Figure 4: The occupational status among hyperuricemic individuals.

5.5. Smoking Status

One hundred fifty-eight (44%) patients were smokers, and 201(56%) patients were nonsmokers as shown in Figure-5 and Table 5.

Table 5: The smoking status among individuals suffering from Hyperuricemia.

Smoking	Frequency	Percentage (%)
Yes	158	44
No	201	56
Total	360	100 %

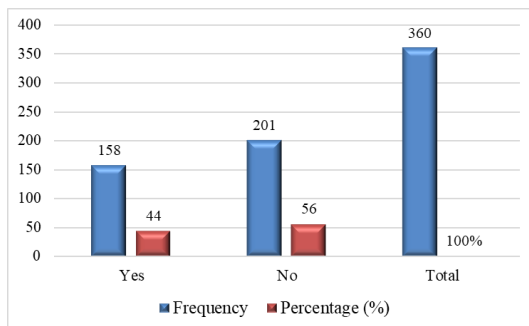


Figure 5: The smoking status among individuals suffering from hyperuricemia.

5.6. Uric Acid Level

234 (65%) had uric acid levels below 7 mg/dl, while 126 (35%) had uric acid levels over 7 mg/dl. as shown in Figure-6 and Table-6.

Table 6: The percentages for the serum uric acid level.

Serum Uric Acid Level	Frequency	Percentage(%)
< 7 mg/dl	234	65
> 7 mg/dl	126	35
Total	360	100 %

Mean Serum uric acid level= 36.47 SD=± 3.05

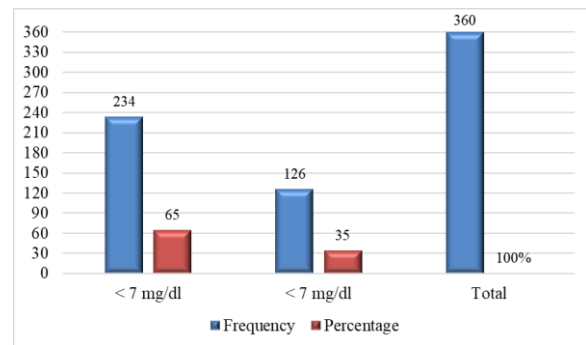


Figure 6: The percentages for the serum uric acid level.

5.7. Hyperuricemia

One hundred twenty-six individuals (35%) were found to have hyperuricemia, whereas 234 patients (65%) did not as shown in Figure-7 and Table-7.

Table 7: Hyperuricemia detection among the individuals studied.

Hyperuricemia	Frequency	Percentage (%)
Yes	126	35
No	234	65
Total	360	100 %

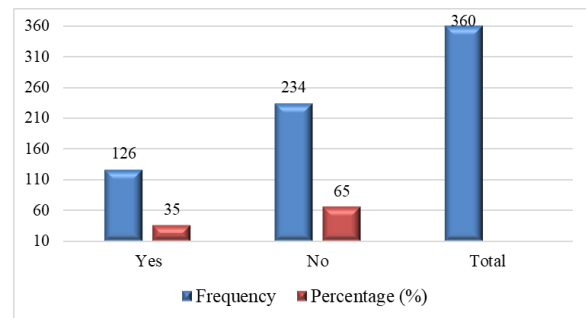


Figure 7: Hyperuricemia detection among the individuals studied.

5.8. Stratification

Stratification of hyperuricemia concerning age, gender, socio-economic status, occupation, and smoking status is mentioned in Figures 8-12 and Tables 8-12.

Table 8: Age factor that interacts with hyperuricemia.

Hyperuricemia	30-40 years	41-50 years	51-60 years	Total
Yes	14	47	65	126
No	26	86	122	234
Total	40	133	187	360

P value= 0.9943

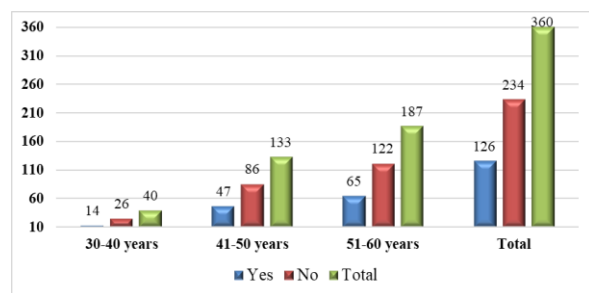


Figure 8: Age factor that interacts with hyperuricemia.

Table 9: Gender factor that factors that interact with hyperuricemia.

Hyperuricemia	Male	Female	Total
Yes	79	47	126
No	148	86	234
Total	227	133	360

P. value= 0.9179

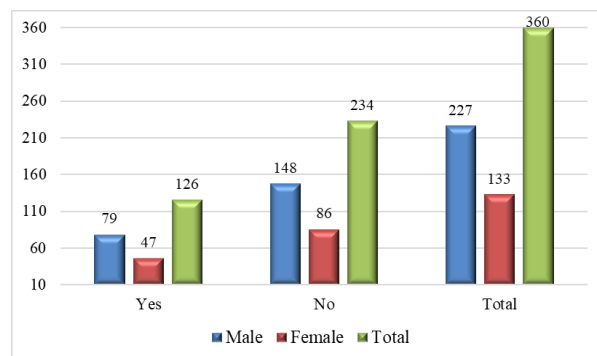


Figure 9: Gender factor that factors that interact with hyperuricemia

Table 10: Socio-economic status that interacts with hyperuricemia.

Hyperuricemia	Rich	Middle Class	Poor	Total
Yes	24	52	50	126
No	44	96	94	234
Total	68	148	144	360

P. value= 0.9957

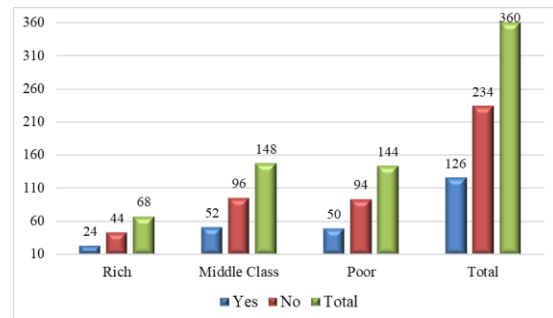


Figure 10: The socioeconomic status that interacts with the Hyperuricemia

Table 11: Professional status that interacts with the hyperuricemia level.

Hyperuricemia	Employees	Un-employees	Total
Yes	77	49	126
No	143	91	234
Total	220	140	360

P. value= 1.0000

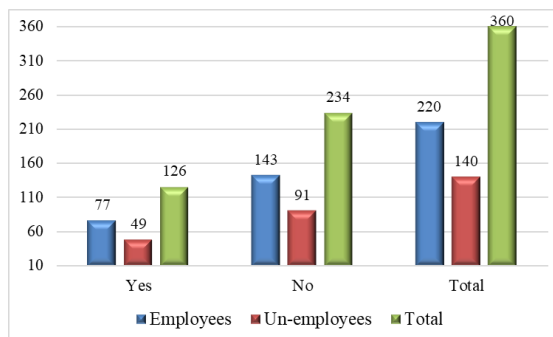


Figure 11: The professional status that interacts with the Hyperuricemia level.

Table 12: Effect of smoking on Hyperuricemia.

Hyperuricemia	Smokers	No-smokers	Total
Yes	55	71	126
No	103	130	234
Total	158	201	360

P. value= 0.8879

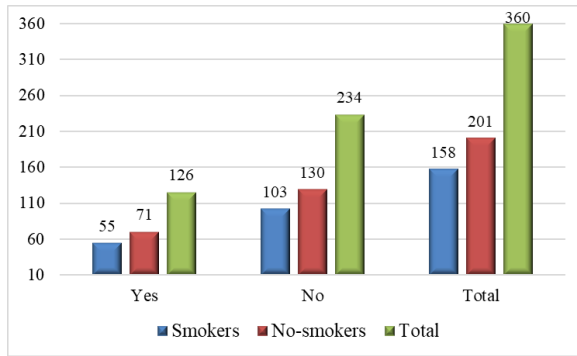


Figure 12: the effect of smoking on Hyperuricemia.

6. Discussion

CAD is a significant global health issue that affects both sexes equally. It contributes significantly to the growing death rate in the industrialized world. In Western nations, there is a high correlation between myocardial infarction and income disparity, showing that those from poorer socioeconomic origins are disproportionately affected by coronary artery disease (17). As a more significant contributor to morbidity and mortality, acute MI is given priority in cardiovascular treatment. Comparable rates of CAD are observed in South Asia, notably Pakistan, and the West. By 2025, it is estimated that one hundred thousand Pakistanis will experience an acute MI. The study revealed that the average age of the patients was 52 years, with a standard deviation of 11.74 years, and that there were males comprising 63% while women made up 37%. 35 percent of the patients analyzed had hyperuricemia, whereas 65 percent did not. Among 112 patients, the hyperuricemic rate was 37.3% in the ACS group and 24.0% in the non-CAD group, similar to the findings of previous research by Majeed M.Z et al (18). This study agrees with an analysis conducted by Majid.A et al., in which 116 patients were observed; 65 were male and 35 were female, for a total of 154 (19). Group I (ACS with hyperuricemia) and Group II (ACS without hyperuricemia) had mean ages of 65.12 and respective BMIs of 273.2 and 252.8. 18% (28) of the 154 people evaluated had conduction problems, and 26% (40) had cardiac failure. Only 24.6% (19) of the 28 individuals who presented with conduction problems also had hyperuricemia. In comparison, only 11.6% (9) of the patients with ACS lacked hyperuricemia. 42% (42.8%) of the heart failure patients who presented with hyperuricemia also had acute coronary syndromes, compared to 9% (7). These results aligned with those of

Abdullah A.S. et al, Twenty-four percent of 114 individuals with acute coronary syndrome were observed to have hyperuricemia. (22.5 % were men, whereas 31.82 % were girls) (20). Significantly more patients with hyperuricemia had a cardiac failure (30.4% vs. 11.4%, $p = 0.032$) and conduction abnormalities (14% vs. 1.4%, $p = 0.017$). Significantly decreased mean ejection ratios were seen in patients with increased uric acid levels (50.87 ± 10.27 percent vs. 55.94 ± 6.66 percent, respectively). Significantly longer hospital stays were associated with hyperuricemia in ACS patients (8.26 ± 1.18 vs. 7.51 ± 1.18 days, p equals 0.010). Analysis by Qureshi A.E. et al. was found to be compatible with the present results; the research comprised 113 participants, and the average age of the group with normal uric acid levels ($n = 59$) was 52.62 ± 9.46 years, while the average age of the group with hyperuricemia ($n = 41$) was 50.52 ± 9.40 years (p is 0.273) (21). The average uric acid level was 4.75 ± 1.05 mg/dL in the normouricemic group, and 7.61 ± 1.24 mg/dL in the hyperuricemic group ($p < 0.001$). The mean Gensini score for the normouricemic group was 22.15 ± 21.52 , whereas the score for the hyperuricemic group was 35.69 ± 26.80 . The Gensini Score was significantly different between the two groups ($p = 0.006$), as determined by the Mann-Whitney U test. Statistics showed a statistically significant difference between the two groups ($p = 0.013$ for total occlusion; $p = 0.046$ for critical lesions): hyperuricemic people were more likely to have critical lesions, occlusions, and multi-vessel disease (21).

7. Conclusion

This current study concludes that the frequency of hyperuricemic patients was 35% among the patients presented with acute coronary syndrome at the Cardiology Department of Khyber Teaching Hospital, Peshawar.

Conflict of interest The authors have indicated they have no competing interests or conflicts of interest.

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