

Positive Association of lunar Phases with The Incidence Rate Acute Myocardial Infarction

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ABSTRACT

Introduction: In addition to primary internal risk factors, certain external factors have been suggested as possible factors pertaining to development of acute myocardial infarction including lunar phases as well as circadian cycles and season changes. The aim of this study is to determine the rate of incidence for acute myocardial infarction in different lunar phases and to illuminate any possible association between certain phases and the occurrence of acute myocardial infarction (AMI).

Materials and Methods: This retrospective cross-sectional study was done evaluating 1549 archived cases for acute myocardial infarction patients who were admitted to Seyyedalshohada Hospital, Urmia, Iran during 2013 to 2014. Considering inclusion criteria, the records were used to extract demographic data, exact date of AMI occurrence regarding lunar calendar, and the outcomes of hospital care. The obtained data were then analyzed by descriptive and inferential statistical methods.

Results: In this study of 1549 patients (mean age 62.03 ± 12.38 years), 70 (4.5%) died, and 1479 (95.5%) were discharged alive. Among the infarctions, 34.2% had non-ST-elevation myocardial infarction (NSTEMI) and 65.8% had ST-elevation myocardial infarction (STEMI), with anterior myocardial infarction (MI) being the most common. Analysis of MI occurrence by lunar phase showed a significant difference ($P=0.001$), with the full moon having the highest frequency of MIs. However, no significant correlation was found between infarction type and lunar phase ($P=0.22$), or between gender and lunar phases ($P=0.55$). No significant differences in MI occurrence were found across age groups ($P=0.68$). Mortality was highest during the full moon, with 5 deaths.

Conclusion: Taking our results into account, it can be postulated that acute myocardial infarction as a representative of acute cardiovascular events is influenced by lunar phases. This idea can be helpful in improving the status of hospital care and reducing mortality rate of cardiovascular patients if considered by emergency staff. However, more studies with larger sample size in different geographical regions are required to further investigate this possibility.

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Introduction

Chronic disorders of atherosclerosis, hypertension, and coronary arterial diseases are among serious medical complications in

both developing and developed countries representing the leading causes of death (1). One of the most important medical interventions in cardiac arrest is the administration of thrombolytic medications,

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the effects of which depend on the elapsed time between the diagnosis of myocardial infarction and their administration. The less the time, the more effective the results (2). Therefore, revealing any underlying risk factors and timely interventions will result in reduced mortality and morbidity. Although atherosclerotic plaque is considered as playing the main role in the occurrence of myocardial infarction, there are other environmental factors, which are believed to associate with infarction such as circadian cycles, different seasons, and lunar phases (3).

The effects of lunar cycles on human behavior and physiology have been reported in several studies indicating certain relations between different moon phases and myocardial infarctions (4), psychiatric disorders and suicide (5-7), seizures (8), and hospital admissions (9). However, the results are conflicting; where there are other studies which also fail to establish any significant correlations between lunar cycles and acute coronary syndromes (10).

In a study conducted to evaluate a traditional Chinese medical theory indicating the association of acute myocardial infarction (AMI) with lunar cycles, the authors found a maximal onset for AMI during the new moon (first day of the lunar calendar) and a minimum occurrence during the full moon (15th of the lunar month) after which the rate gradually increases again until the beginning of the next lunar month (4). Similar to that, another study aiming to evaluate the occurrence of acute coronary syndromes (angina, ST-elevated myocardial infarction (STEMI), and non-ST elevated myocardial infarction (NSTEMI)) concluded a significant difference for the admissions of patients with acute coronary syndromes within the different phases of the moon (11). Frequent occurrence of left anterior descending coronary disorder in full moon was suggested by Sari et al in a study investigating the impact of lunar phases on STEMI and success of primary percutaneous coronary intervention (PCI). However, they failed to demonstrate significant lunar phases association with STEMI, where 24.8%, 24.8%, 27.7%, and 22.8% of studied cases were distributed in new moon, waxing moon, full moon, and waning moon phases (12).

Conflicting results have also been maintained in various reports. Alves et al. in a study determining the number of cardiopulmonary resuscitations performed over 11 years. The authors showed no significant difference in the occurrence of cardiopulmonary resuscitations during full moon while there were fewer cases during new moon days (13). Moreover, Eisenberger et al. in a prospective study reported an equal occurrence rate of acute myocardial infarction and cardiac arrest for different days within each phases of lunar month (14). In the present study, we aimed to investigate the possible association of myocardial infarctions with different lunar phases. Moreover, any probable differences regarding sex and age of patients in association of lunar phases with AMI occurrence were also investigated.

Materials and Methods

Study population and study design

This retrospective study was conducted by analyzing archived documents of 1549 patients who were admitted to Seyodolshohada hospital, Urmia, Iran as acute myocardial patients during 05, Nov 2013 to 14, Oct 2015. Ethical protocols of the study were validated by the Ethical Committee of Urmia University of Medical Sciences and all information were obtained using anonymous codes without mentioning patients' names.

Patients were included in the study based on the following inclusion criteria. Demonstrating typical serum elevation of cardiac enzymes in company with at least one of these symptoms: any ischemic sign, pathologic development of Q wave in ECG, any variation in ECG pertaining to ischemia like elevation or depression of ST segment, and coronary arterial intervention.

Using standard questioner, all required information including gender, age, exact date of AMI occurrence, mortality status, comorbid disorders, and disease risk factors were extracted. Patients were divided into separate groups based on their ischemia type: NSTEMI (non ST-elevated myocardial infarction) and STEMI (ST-elevated myocardial infarction) which itself is divided

into two subcategories: Anterior STEMI, and Inferior STEMI.

Lunar phases

The exact time of lunar phases were obtained using official NASA website based on our longitude and latitude coordinates. Each lunar month was divided into four phases: 1) new moon (when the lunar disk is not visible to the unaided eye), 2) first quarter (when one half of the moon's disk is illuminated by the sun and the moon's illumination is increasing), 3) full moon (when the moon appears fully illuminated from Earth's perspective), 4) third quarter (when the moon is one-half illuminated by the sun and the moon's illumination is decreasing). Patients were categorized considering their exact date of heart attack according to lunar calendar and lunar phases.

Statistical analysis

All descriptive data were analyzed using frequency and mean±SD. Parametric tests including ANOVA, Chi-Square test, and Fisher's exact test were conducted using SPSS V.18. In all tests, P value less than 0.05 was considered statistically significant.

Results

A total of 21 patients who met the criteria were included in the study. There were 15 males and 6 females. The mean age was 75.3±11.9, the median age was 77 years

(range: 45-92). Characteristics of the patients were summarized in Table 2. Malignant conditions constituted the majority of the etiologies (n=8, 38.1%). The most common main complaint as the cause for hospital admission was dyspnea (n=7, 33.3%). In addition, other common complaints were pain, nutritional issues, and pressure ulcers. The most common pathology requiring pleural intervention was large pleural effusion and the most preferred pleural intervention was thoracentesis (n=10, 47.6%). When the VAS, Borg dyspnea scale and KPS and scores of the patients at hospitalization and on the 1st day after pleural intervention were compared, there was no significant difference between pain scores, but it was found that the mean dyspnea score was lower, and the mean performance score was higher after pleural intervention (p values are 0.25, <0.001 and <0.001 respectively) (Figure 1).

Among the 10 patients who underwent thoracentesis, 2 patients developed iatrogenic pneumothorax. In these patients, the pneumothorax was small and regressed with oxygen therapy without the need for chest tube placement.

A total of 1549 cases were analyzed in the current study of whom, 1120 (72.3%) cases were male and 429 (27.7%) individuals were female. The mean age of patients was 62.03±12.38 years distributing between 23 years and 95 years. In the time of discharging from hospital, 70 (4.5%) individuals were deceased while 1479 (95.5%) cases were discharged alive.

Table1. Distribution of cases in different lunar phases.

Lunar phase	New moon	Full moon	First quarter	Third quarter
Cases (n)	51	85	57	50
Frequency (%)	21	35	23.5	20.5

Table 2. The frequency of myocardial infarction in different lunar phases separated by age.

Lunar phases	Age groups (years)			
	<35	35-50	50-70	70<
New moon	1 (25%)	6 (16.2%)	24 (17.9%)	20 (29.4%)
First quarter	0 (0%)	11 (29.7%)	31 (23.1%)	15 (22.1%)
Full moon	2 (50%)	13 (35.1%)	48 (35.8%)	22 (32.4%)
Third quarter	1 (25%)	7 (18.9%)	31 (23.1%)	11 (16.2%)
Total	4 (100%)	37 (100%)	134 (100%)	68 (100%)

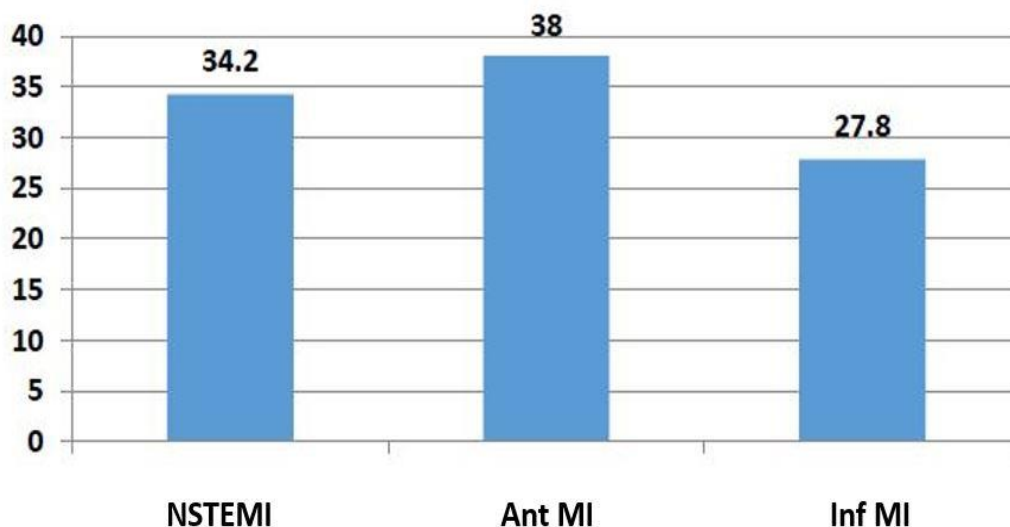


Figure 1. Frequencies of patients considering infarction type

Infarction type

Considering the type of myocardial infarction (with or without ST segment elevation), from all 1549 analyzed cases, 530 (34.2%) experienced NSTEMI and 1019 (65.8%) individuals were STEMI among whom 589 (38%) cases were Ant MI and 430 (27.8%) cases were Inf MI. Chart 1 demonstrates these frequencies. It indicates higher frequency of STEMI cases comparing to NSTEMI. Anterior MI patients were the most frequent cases, considering STEMI and even the whole analyzed cases.

Association with lunar phases

After analyzing the cases considering the date of MI occurrence, 243 patients could be linked to four days of lunar phases and were selected to be categorized into different groups. 51, 85, 57, and 50 cases were in new moon, full moon, first quarter, and third quarter categories, respectively, as it is illustrated in table 1. Using Chi-Square test, it was revealed that there is statistically significant difference between lunar phases regarding myocardial infarction occurrence (P=0.001). it occurs more frequently in full moon following first quarter.

Considering the distribution of three different types of myocardial infarction among patients linked to the four considered lunar phases, our results demonstrated that 19 NSTEMI, 16 Ant MI, and 16 Inf MI cases were occurred in new moon; 23 NSTEMI, 41 Ant MI, and 21 Inf MI cases were occurred in

full moon; 18 NSTEMI, 19 Ant MI, and 20 Inf MI cases occurred in first quarter; and 14 NSTEMI, 23 Ant MI, and 13 Inf MI cases were occurred in third quarter. Chart 2 illustrates this distribution. Full moon is the lunar phase in which the most cases of NSTEMI, Ant MI and Inf MI cases were occurred. However, there was not any statistically significant correlation between different types of infarction and their association with different lunar phases (P=0.22).

Considering sex differences, 38 males and 13 females were new moon cases; 43 males and 14 females were first quarter cases; 56 males and 29 females were full moon cases; and 34 males and 16 females were third quarter cases. Based on the results of Chi-Square test, no statistically significant differences regarding gender was revealed in the cases of different lunar phases (P=0.55).

The patients were divided into four groups regarding their age: less the 35 years, 35-50 years, 50-70 years, and more than 70 years. Analyzing the frequency of myocardial infarction occurrence of different age groups in various lunar phases, no statistically significant differences was observed (p=0.68). Table 2 shows these frequencies.

The total of 9 deaths of patients could be included in different lunar phases. One death occurred in new moon, 5 deaths in full moon and 3 deaths occurred in first quarter. None of the deaths was in third quarter. Full moon was the phase in which most of the deaths were occurred.

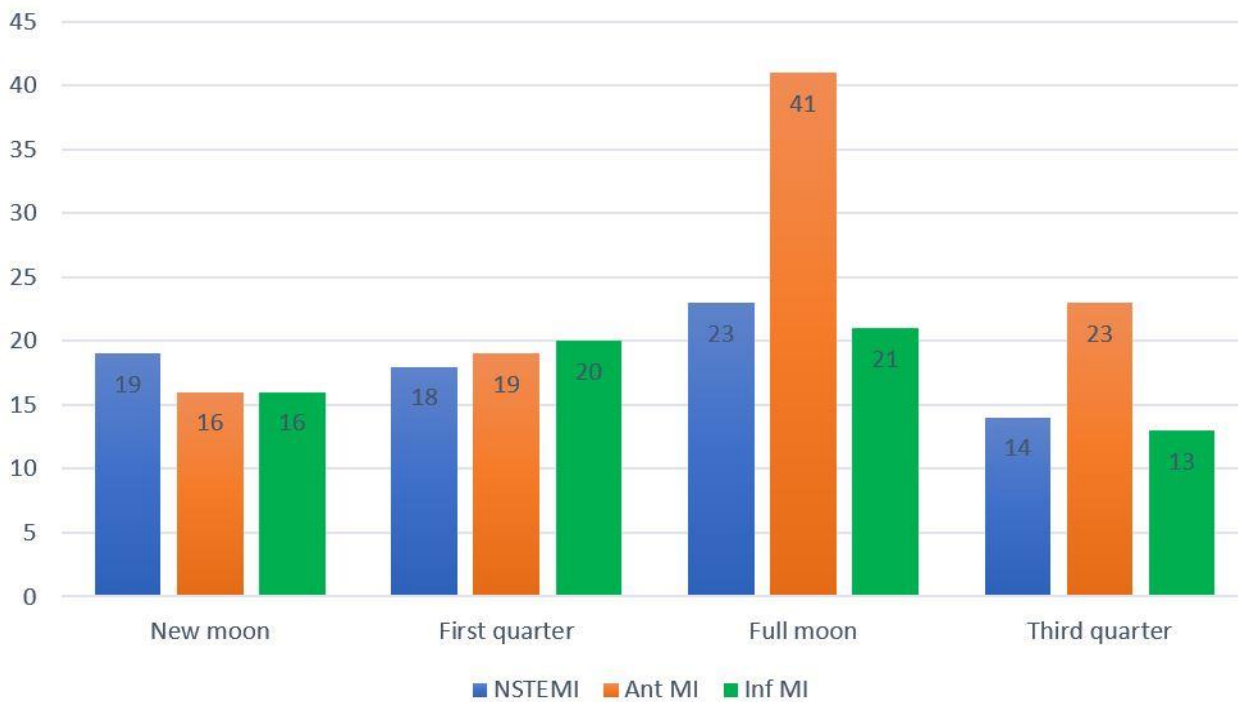


Figure 2. Distribution of different infarction types in four lunar phases

Discussion

Inconsistent results on association of lunar cycles with myocardial infarction and myocardial death make it difficult to come up with convincing conclusions (15). The occurrence of AMI varies upon daily and yearly basis, where more events occur in the morning and during winter months (16), however, more investigations are required to establish convincing associations with different lunar phases.

The results from current study indicate significant association between lunar phases and the rate of myocardial infarction in our population, it is more prevalent in full moon. However, little difference is there between males and females regarding the association with lunar phases indicating that gender similar to age variations do not impose significant differences in the occurrence of myocardial infarction. Sari et al in 2013 investigated the impact of lunar phases on the occurrence of STEMI, culprit vessel and success of primary percutaneous coronary intervention on 452 Turkish patients and did not report any significant relation between STEMI occurrence and lunar phases. Moreover, there was not any significant difference between males and females regarding the association of coronary

diseases and lunar phases (12). The absence of such difference between genders is affirmed in our study, however, our results about the association of lunar phases and myocardial infarction is in contrast to their report, which might be due to our larger sample size.

In another study conducted in US in 2013, Shuhaiber et al studied the influence of lunar cycles as well as seasons on the results of ascending aortic dissection repair on 210 patients. They also analyzed such relationships with the length of stay following surgery for survivors. They concluded that seasons have no influence on mortality or length of stay while the odds of death were significantly increased by age. The authors report that full moon cycle seems to reduce the rate of mortality (17) in contrast to our results which represents more death frequency in full moon. This inconsistency might be due to different types of cardiac disorders studied, sample size and other effective factors in disease progression that require more investigation.

Improving hospital care and reducing mortality rates in cardiovascular patients requires early diagnosis and timely intervention. Regular screenings, such as ECGs, blood tests, and imaging, allow for the detection of conditions like hypertension,

diabetes, and high cholesterol, which can be managed before complications arise. Evidence-based treatment protocols, such as those for myocardial infarction (MI) or heart failure, ensure patients receive the best care, including medications like anticoagulants and advanced therapies such as PCI or CABG. Additionally, patient monitoring and follow-up care are crucial in preventing complications and readmissions. Multidisciplinary care teams, including cardiologists, nurses, and physiotherapists, provide comprehensive management, while staff training ensures effective treatment and communication. Access to advanced technologies, such as echocardiography and cardiac MRI, improves diagnosis and treatment outcomes. Finally, patient education on lifestyle changes, medication adherence, and self-care is key to reducing long-term mortality and enhancing overall patient quality of life.(17 ,16)

The higher rates of heart attack in the first day of lunar month, decreasing until the 15th and increasing again until the end of the month have been previously reported by Sha et al in 1989 (4). In line with this report, Wende et al in 2012 investigated the potential association of lunar phases on the occurrence of fatal and non-fatal myocardial infarction on 15985 patients in a retrospective study. They reported no significant association between the occurrence of AMI and new moon, full moon, waning moon, and waxing moon although a significantly cardioprotective effect for three days after a new moon on the occurrence of AMI was observed. On the contrary, the day before a new moon was reported to have a slightly negative effect (15). Similar to their report, our results also demonstrate higher frequencies of myocardial infarction (both STEMI and NSTEMI) in full moon group and low frequencies of Ant MI and Inf MI (sub-categories of STEMI) in new moon and third quarter, respectively.

The limitations of this study include the inconsistent results regarding the impact of lunar cycles on myocardial infarction (MI). While our findings suggest a significant association between full moon and an increased rate of MI, previous studies have not identified consistent patterns. The differences may be attributed to sample size,

study design, and the type of cardiac disorders investigated. Additionally, this study did not account for other influencing factors such as seasonal variations, environmental factors, and individual patient characteristics, which could affect the results. Furthermore, the generalizability of the findings is limited to the studied population, and results may differ in other demographic or geographic groups.

Conclusion

Based on the results of the present study, the idea of acute myocardial infarctions being under the influence of different lunar phases comes to the mind. Therefore, this possibility should be considered in the caring process of myocardial infarction patients in hospitals and emergency centers. This consideration can lead into lower rates of mortality. However, similar studies have not comprehensively yield to similar results and the matter is still under dispute. Therefore, further studies in different regions with larger numbers of patients are required to address this controversy.

References

1. Dholpuria R, Raja S, Gupta BK, Chahar CK, Panwar RB, Gupta R, et al. Atherosclerotic risk factors in adolescents. *The Indian Journal of Pediatrics*. 2007 Sep;74:823-6.
2. Horlocker TT, Wedel DJ, Rowlingson JC, Enneking FK, Kopp SL, Benzon HT, et al. Regional anesthesia in the patient receiving antithrombotic or thrombolytic therapy: American Society of Regional Anesthesia and Pain Medicine Evidence-Based Guidelines. *Regional Anesthesia & Pain Medicine*. 2010 Jan 1;35(1):64-101.
3. Nagarajan V, Fonarow GC, Ju C, Pencina M, Laskey WK, Maddox TM, et al. Seasonal and circadian variations of acute myocardial infarction: Findings from the Get With The Guidelines-Coronary Artery Disease (GWTG-CAD) program. *American heart journal*. 2017 Jul 1;189:85-93.
4. Wende R, Von Klot S, Kirchberger I, Kuch B, Von Scheidt W, Peters A, et al. The influence of lunar phases on the occurrence of myocardial infarction: fact or myth? *The MONICA/KORA Myocardial Infarction Registry*. *European journal of preventive cardiology*. 2013 Apr 1;20(2):268-74.
5. Bunevicius A, Gendvilaite A, Deltuva VP, Tamasauskas A. The association between lunar

phase and intracranial aneurysm rupture: Myth or reality? Own data and systematic review. *BMC neurology*. 2017 Dec;17:1-5.

6. Sado J, Morikawa K, Hattori S, Kiyohara K, Matsuyama T, Izawa J, et al. Full Moon and Out-of-Hospital Cardiac Arrest in Japan—Population-Based, Double-Controlled Case Series Analysis—. *Circulation Reports*. 2019 May 10;1(5):212-8.

7. Uddin M, Nursetyo AA, Iqbal U, Nguyen PA, Jian WS, Li YC, et al. Assessment of effects of moon phases on hospital outpatient visits: An observational national study. *AIMS Public Health*. 2023;10(2):324.

8. Kirchberger I, Wolf K, Heier M, Kuch B, Von Scheidt W, Peters A, et al. Are daylight saving time transitions associated with changes in myocardial infarction incidence? Results from the German MONICA/KORA Myocardial Infarction Registry. *BMC Public Health*. 2015 Dec;15:1-8.

9. Kirchberger I, Amann U, Heier M, Kuch B, Thilo C, Peters A, et al. Presenting symptoms, pre-hospital delay time and 28-day case fatality in patients with peripheral arterial disease and acute myocardial infarction from the MONICA/KORA Myocardial Infarction Registry. *European Journal of Preventive Cardiology*. 2017 Feb 1;24(3):265-73.

10. Rajan K, Richard L B, Shereif H R. Impact of lunar phase on the incidence of cardiac events. *World Journal of Cardiovascular Diseases*. 2012 Jul 23;2012.

11. Oomman A, Ramachandran P, Subramanian P, Nagaraj BM. A novel trigger for acute coronary

syndromes: the effect of lunar cycles on the incidence and in-hospital prognosis of acute coronary syndromes--a 3-year retrospective study. *Journal of the Indian Medical Association*. 2003 Apr 1;101(4):227-8.

12. Sari İ, Alici H, Davutoglu V, Ozer O, Yavuz F, Yuce M, et al. Impact of Lunar Phases on the Occurrence of Acute ST Elevation Myocardial Infarction, Culprit Vessel and Success of Primary Percutaneous Coronary Intervention. *Menopause*. 2013 Oct 29;47(82):5.

13. Takagi H, ALICE (All-Literature Investigation of Cardiovascular Evidence) Group. ACS in lunar wonderland: lunar phases and acute coronary syndrome. *European Journal of Preventive Cardiology*. 2020 Dec;27(19):2142-4.

14. Tashiro A, Kawana A, Komaru T. The Lunar Phases and the Occurrence of Acute Myocardial Infarction. *Journal of Cardiac Failure*. 2014;10(20):S156.

15. Puche JE, Iturregui-Guevara M. Effect of environmental conditions and lunar phase on the incidence of ischemic heart disease. *Novel Research in Sciences*. 2022 Jul 18;11:000763.

16. Franklin BA, Jae SY. Physical Activity, Cardiorespiratory Fitness and Atherosclerotic Cardiovascular Disease: Part 1. *Pulse*. 2024 Jul 15;12(1):113-25.

17. Luo ZR, Lin ZQ, Chen LW, Qiu HF. Effects of seasonal and climate variations on in-hospital mortality and length of stay in patients with type A aortic dissection. *Journal of cardiothoracic surgery*. 2021 Dec;16:1-8.