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Seasonal Variation in Hospital Admission for Acute Myocardial Infarction in Al-Diwanya City

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Annotation: The effects of environmental variations on the onset and course of cardiovascular events are not yet fully elucidated. A dramatic surge in the incidence of myocardial infarction was observed during early morning hours, accompanied by a notable increase in mortality from myocardial infarction during the winter months. The objective of this study was to ascertain the existence of a seasonal pattern in the admissions to cardiology intensive care units (CICU) for patients with myocardial infarction (MI) and to examine the mortality rate of these patients during their stay. Additionally, the study sought to elucidate the association between the season of admission to CICU for patients with MI and their socio-demographic characteristics and medical history.

The present study was conducted in accordance with the following methodology.

A cross-sectional study design was employed. The study population comprised 1,732 patients with myocardial infarction who were admitted to the CICU in four hospitals in Al-Qadisiya Province over the two-year period from 1 December 2023 to 1 Feb 2024.

The results of the study are as follows:

The proportion of patients admitted to hospital during the winter, spring, summer, and autumn seasons was 36.7%, 19.5%, 21.2% and 22.6%, respectively. The mean age of patients was found to be 63.11 years (± 12.96). The proportion of patients over the age of 60 was 57.6%, the proportion of female patients was 50.3%, and 53.8% of patients resided in urban areas.

The majority of patients (63.9%) were married, while the majority of those who were not employed (67.7%) were also married.

As indicated by the patient's medical history, 49.3% of patients exhibited symptoms for a period of three hours prior to admission. Furthermore, 89.4% of patients remained in the CICU for a duration of less than three days. It is noteworthy that 77.7% of patients had not previously been admitted to the CICU. Additionally, 29.0% of patients were smokers, while only 7.3% of patients consumed alcohol. Thirty percent of patients exhibited a family history of IHD, while the mean outcome was as follows: 71.4% were discharged, and 28.6% died.

The present study revealed a significant association between the season of admission to the CICU and the patient's age (P-value < 0.003), sex (P-value < 0.001), and occupational status (P-value < 0.001).

In addition, a substantial correlation was identified between the season of admission and the duration of home-based care for each of the following:

- compliance at home (P-value < 0.001),

- previous admission to the CICU (P-value < 0.001),

- family history of IHD (P-value < 0.001), and

- patient outcome (P-value < 0.001). The findings of this study demonstrate that there is an absence of a statistically significant correlation between the season of admission and the following variables: residence, marital status of the patient, duration of stay in the CICU, and alcohol consumption or smoking.

Conclusion:

A seasonal pattern is evident in the admissions for myocardial infarction in the sample of data collection, with an increase in the number of cases in winter and a decrease in summer. The age of patients has been demonstrated to influence the effect of environmental factors on myocardial infarction. A substantial body of evidence has been found to demonstrate a clear correlation between the season of admission to the hospital and both sex and occupational status. A robust correlation was identified between the season of hospital admission and the duration of symptoms experienced in the home environment. This association remained consistent when controlling for prior admission to the CICU, family history of IHD, and patient outcomes.

Keywords: Acute Myocardial Infarction, Seasonal Variation, IHD, CICU, ADMISSION.

INTRODUCTION

Ischemic Heart Disease (IHD) is the most common cause of death in most Western countries and a major cause of hospital admissions. This condition has been estimated to account for one in three deaths in the United States of America and to affect individuals at any age, although it is most prevalent among the elderly. The evidence suggests that males are affected more often than females; however, the rates equalise between men and women following menopause [1, 2].

Myocardial infarction (MI) is usually caused by a sudden blockage in the blood flow to a part of the heart, resulting in the heart muscle becoming damaged due to a lack of oxygen. The phenomenon under discussion can be considered a consequence of coronary artery blockage, precipitated by an unstable accumulation of white blood cells, cholesterol, and fat [3]. The risks for IHD and MI increase with age, smoking, high cholesterol levels, diabetes, high blood pressure, family history, and seasonal circadian variations.

Nonetheless, the consequences of environmental variations on the onset and progression of cardiovascular events remain to be fully elucidated. A dramatic increase in the incidence of myocardial infarction (MI) was observed during the early morning hours. This increase in incidence was accompanied by a notable rise in mortality from MI, a phenomenon that was first documented and reported during the 1930s. Subsequent to the initial observations, a number of studies have been reported from European[4 and 5], North American[6 and 7] and Asian[8 and 9] countries. These studies have indicated a rise in the incidence of mortality due to myocardial infarction during the winter months. The exposure to winter weather conditions has been demonstrated to induce physiological stresses, including sympathetic activation, hypercoagulability, and infection. These factors have been shown to increase the incidence or case fatality of myocardial infarction (MI) [10-14].

Notwithstanding the elevated incidence of myocardial infarction (MI) in Iraq and the considerable seasonal fluctuation between winter and summer, there is a paucity of data regarding the occurrence of MI during the Iraqi winter. The present study was conducted with the objective of ascertaining the proportion of patients diagnosed with myocardial infarction (MI) according to the season of hospital admission. Furthermore, the study sought to identify any potential correlations between the season of admission and patients' socio-demographic characteristics, as well as their medical history[15].

MATERIALS AND METHODS

The following section outlines the methods that were employed in the execution of this study. The study methodologically addressed the challenges posed by the study location, the study design, and the statistical analysis employed to test the study hypotheses.

The present study was a hospital-based cross-sectional study conducted with the objective of determining the proportion of patients with acute myocardial infarction by the season of admission to the hospital. Furthermore, the study sought to ascertain the associations between the season of admission to the hospital and patients' socio-demographic characteristics and medical history.

The total number of patients who have been admitted to the CICU at Al Diwanya Teaching Hospital, Al Shamiya General Hospital, Afak General Hospital, and Al Hamza General Hospital in Al-Qadysia Province for the last two years (1 December 2023 to 1 February 2024) was 3,534. A total of 1,784 patients were admitted to the hospital with a primary diagnosis of acute myocardial infarction. Following the exclusion of 52 patients due to incomplete information, the remaining 1,732 patients were included in the subsequent study.

The objective of this study was to collate data on patients admitted to CICUs in Al-Qadysia Province for acute myocardial infarction over the preceding two years. The study comprised patients with complete case files containing socio-demographic information, such as age, sex, marital status, occupational status, and residence. Factors related to patients' medical history included the duration of complaints experienced at home, previous admission to the CICU, smoking, alcohol consumption, family history of IHD, and the presence of concomitant chronic diseases. The study utilised a structured questionnaire as its primary instrument.

The statistical analysis was conducted utilising SPSS version 18. Categorical variables were presented as frequencies and percentages.

The continuous variables were presented as the mean ± standard deviation (SD) with a 95% confidence interval (CI). Pearson's chi-squared (X2) test and Fisher's exact test were used to ascertain the association between the categorical variables.

A p-value of ≤ 0.05 was considered to be statistically significant.

Results

Fig 1- Distribution of patients with acute myocardial infarction by age

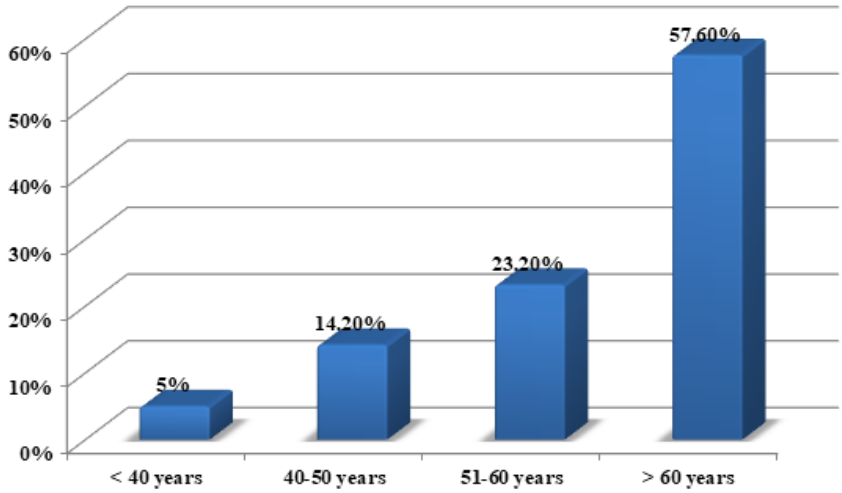

Figure 2 shows the distribution of patients with acute myocardial infarction by sex; the majority (50.3%) were female.

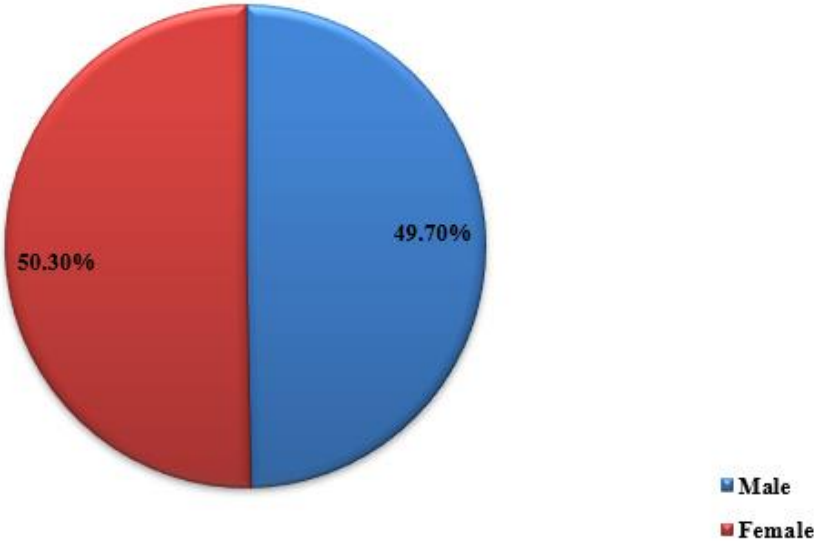

Fig 2: Distribution of patients with acute myocardial infarction by sex

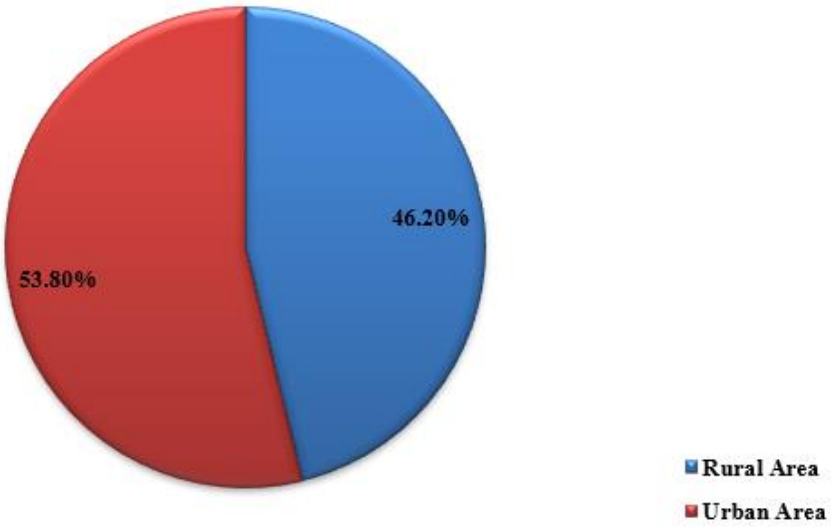

Figure 3: Distribution of patients with acute myocardial infarction by residence

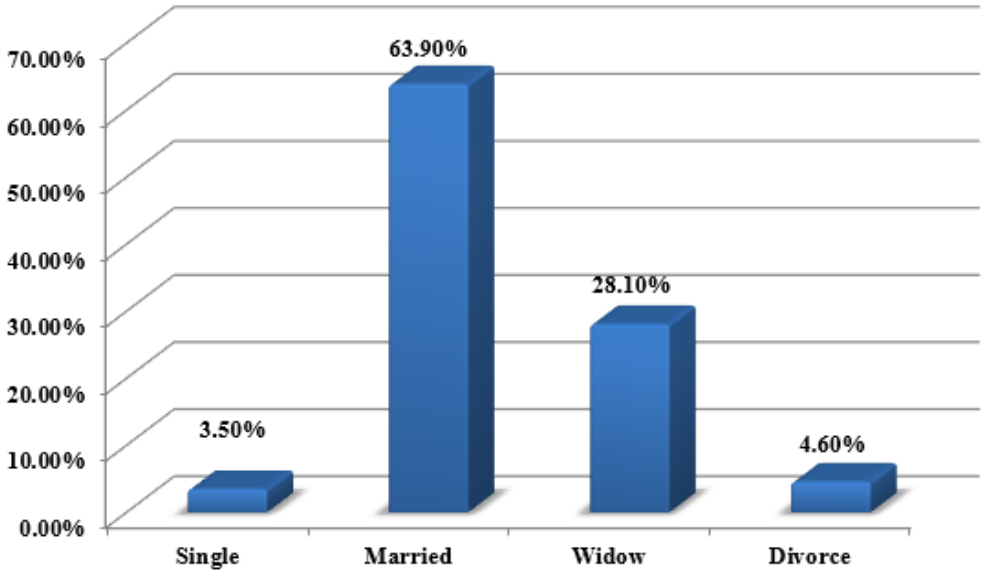

Figure 4: Distribution of patients with acute myocardial infarction by marital status

Figure 5 shows the distribution of patients with acute myocardial infarction by occupational status, majority (67.7%) of the patients were non-employed.

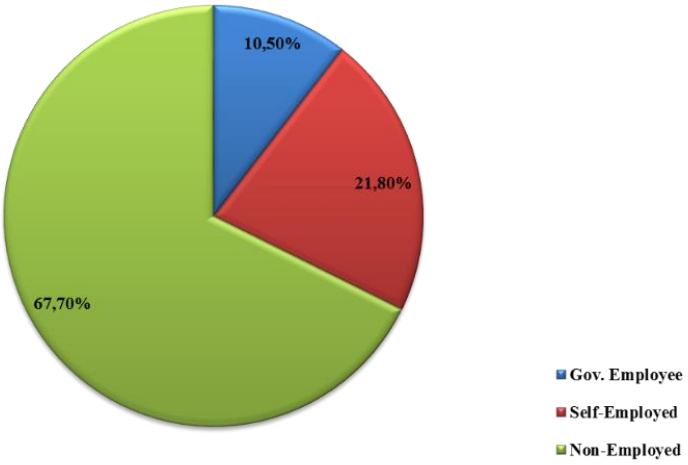

Table 1: Distribution of patients with acute myocardial infarction by medical history

Variable	Frequency (%)
Duration of complaining at home	
< 3 hours	854 (49.3%)
3-6 hours	394 (22.7%)
> 6 hours	484 (27.9%)
Duration of staying in hospital	
< 3 days	1548 (89.4%)
3-6 days	142 (8.2%)
> 6 days	42 (2.4)
Previous admission to CCU	
Yes	386 (22.3%)
No	1346 (77.7%)
Smoking cigarette	
Smoker	502 (29.0%)
Non-Smoker	1230 (71.0%)
Alcohol consumption	
Yes	126 (7.3%)
No	1606 (92.7%)
Family history of IHD	
Yes	520 (30.0%)
No	1212 (70.0%)
Presence of concomitant chronic diseases (Ht. Dm)	
Yes	666 (38.5%)
No	1066 (61.5%)
Patient's outcome	
Discharge	1236 (71.4%)
Death	496 (28.6%)

Figure 6: Proportion of patients with acute myocardial infarction by the season of admission to hospital

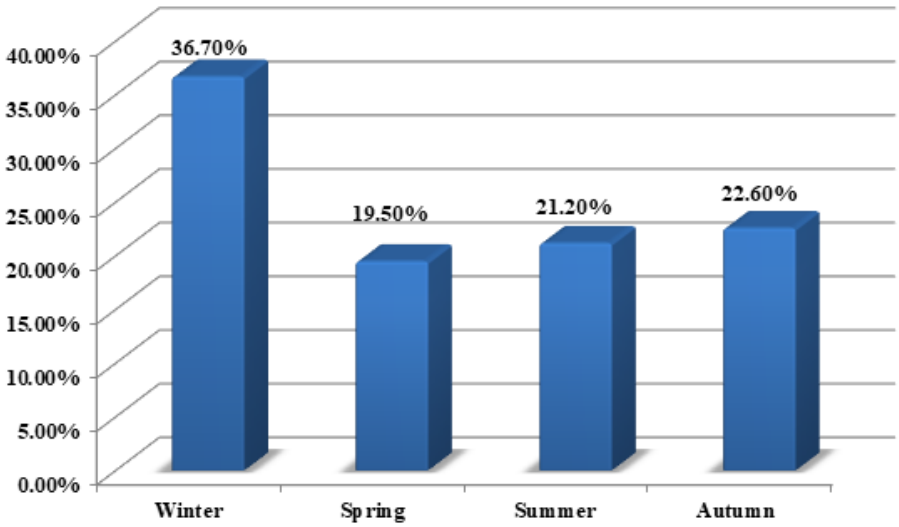

Table 2: Association of season of admission to hospital with patients' socio-demographic characteristics

Variable	Season of Admission to Hospital				χ^2	*P*-values
	Winter (%)	Spring (%)	Summer (%)	Autumn (%)		
Age Groups < 40 years 40-50 years 51-60 years > 60 years	38 (6.0) 76 (11.9) 130 (22.0) 382 (60.1)	20 (5.9) 36 (10.7) 72 (21.3) 210 (62.1)	14 (3.8) 60 (16.4) 86 (23.5) 206 (56.3)	14 (3.6) 74 (18.9) 104 (26.5) 200 (51.0)	**24.684**	**0.003***
Sex Male Female	 312 (49.1) 324 (50.9)	 160 (47.3) 178 (52.7)	 160 (43.7) 206 (56.3)	 228 (58.2) 164 (41.8)	**17.333**	**0.001***
Residence Urban area Rural area	 340 (53.5) 296 (46.5)	 182 (53.8) 156 (46.2)	 156 (57.4) 210 (42.6)	 192 (51.0) 200 (49.0)	3.133	0.372
Marital Status Married Single Widow Divorce	 412 (64.8) 20 (3.1) 172 (27.2) 32 (5.0)	 210 (62.1) 16 (4.7) 98 (29.1) 14 (4.1)	 238 (65.0) 12 (3.3) 106 (29.0) 10 (2.7)	 246 (62.8) 12 (3.1) 110 (28.1) 24 (6.0)	7.870	0.453
Occupational Status Governmental Employee Self-Employed Non-Employed	 58 (9.1) 160 (25.2) 418 (65.7)	 48 (14.2) 50 (14.8) 240 (71.0)	 46 (12.6) 68 (18.6) 252 (68.8)	 30 (7.7) 100 (25.5) 262 (66.8)	**26.021**	**<0.001***

*p value ≤ 0.05 is significant

Table 3: Association of season of admission to hospital with patients' medical history

Variable	Season of Admission to Hospital				χ^2	*P*-values
	Winter (%)	Spring (%)	Summer (%)	Autumn (%)		
Duration of complaining at home						
< 3 hours	564 (88.7)	312 (92.3)	330 (90.2)	342 (87.2)	**27.665**	**<0.001***
3-6 hours	64 (10.1)	10 (3.0)	28 (7.7)	40 (10.2)		
> 6 hours	8 (1.3)	16 (4.7)	8 (2.2)	10 (2.6)		
Duration of staying in hospital						
< 3 days	302 (47.5)	170 (50.3)	188 (51.4)	194 (49.5)	4.287	0.498
3-6 days	152 (23.9)	82 (24.3)	80 (21.9)	80 (20.4)		
> 6 days	182 (28.6)	86 (25.4)	98 (26.8)	108 (30.1)		
Previous admission to CCU						
Yes	164 (25.8)	70 (20.7)	92 (25.1)	60 (15.3)	**17.654**	**<0.001***
No	472 (74.2)	268 (79.3)	244 (74.9)	244 (74.7)		
Smoking cigarette						
Smoker	188 (29.6)	94 (27.8)	108 (29.5)	112 (28.6)	0.415	0.545
Non-Smoker	448 (70.4)	244 (72.2)	258 (70.5)	280 (71.4)		
Alcohol consumption						
Yes	48 (7.5)	30 (8.9)	24 (6.6)	24 (6.1)	2.406	0.412
No	588 (92.5)	308 (91.1)	342 (93.4)	368 (93.9)		
Family history of IHD						
Yes	166 (26.1)	104 (30.8)	102 (27.9)	148 (37.8)	**16.678**	**<0.001***
No	470 (73.9)	234 (69.2)	264 (72.1)	244 (62.2)		
Presence of concomitant chronic diseases						
Yes	328 (51.6)	42 (12.4)	82 (22.4)	214 (54.6)	**223.45**	**<0.001***
No	308 (48.4)	296 (87.6)	284 (77.6)	178 (45.4)		
Patient's outcome						
Discharge	384 (60.4)	272 (80.5)	312 (85.2)	268 (68.4)	**87.464**	**<0.001***
Death	252 (39.6)	66 (19.5)	54 (14.8)	124 (31.6)		

*p value ≤ 0.05 is significant

Discussion

The identification of specific patterns in the timing of the onset of acute myocardial infarction is of scientific importance because such patterns imply the existence of triggers external to the atherosclerotic plaque. The present study has determined that 36.7% of acute myocardial infarction cases occur during the winter months. Despite the emphasis placed on the utilisation of death certificate data, the seasonal pattern of acute myocardial infarction remains a salient factor. A substantial body of research has substantiated the existence of a seasonal pattern in the incidence of fatal acute myocardial infarction across various geographical regions, including the United States [16]. Nevertheless, the accuracy of death certificates in accurately diagnosing the specific cause of death is often questionable. This phenomenon may be attributed to the tendency of medical professionals to categories acute myocardial infarction within broader classifications of death from ischemic heart disease as a cause of death [17,18].

It is evident that, thus far, the accurate and precise calculation of seasonal variations in the incidence of acute myocardial infarction has necessitated the establishment of a substantial registry encompassing all documented cases of this condition within a substantial and geographically representative sample of the population. However, it is imperative that this registry identifies all cases of acute myocardial infarction, including those presenting as sudden death or with atypical or no symptoms such as silent infarction. Regrettably, a nationwide registry to identify cases of acute myocardial infarction is not available, even in the United States [19,20].

The present study has revealed that elderly individuals over the age of sixty have been highly affected by seasonal variations, representing the highest percentage in all seasons. Despite the paucity of epidemiological data on seasonal changes in the incidence of acute myocardial infarction, it is

important to note that research in this area is ongoing. Nonetheless, two studies have proposed that the incidence of acute myocardial infarction is elevated during the winter months, particularly among elderly patients. Conversely, a higher incidence of cases has been observed during the spring season among younger patients [21]. It is evident that the extant data reported from studies has been derived from hospital admissions records. Such records are susceptible to substantial referral biases and, consequently, may not accurately reflect the demographics of the community. A number of recent studies have examined the potential mechanisms through which the elderly may be more susceptible to increased wintertime acute myocardial infarction incidence compared to younger demographics. However, elderly individuals may be subject to elevated levels of cold exposure for a variety of reasons. The evidence suggests that elderly individuals with low incomes experience a higher rate of exposure to cold weather than other age demographics. Conversely, it has been demonstrated that the elderly population may exhibit exaggerated responses to winter weather conditions, characterised by heightened increases in blood pressure and coagulation parameters, as well as infection [22]. A number of physiological changes have been identified that have the potential to increase the probability of the elderly being affected by seasonal variations. The onset of acute myocardial infarction has been related to the presence of a vulnerable plaque, plaque disruption and fissuring, and superimposed thrombosis [23]. However, it has been demonstrated that serum cholesterol, C-reactive protein, blood pressure, fibrinogen, and factor VII activity exhibit higher levels during the winter months. It has been demonstrated that such physiologic changes may disrupt plaques by hemodynamic forces, including increases in blood pressure, subsequent thrombosis, and an augmented tendency towards arterial thrombosis. In addition, there is a higher incidence of acute coronary syndromes during the winter months [24].

The incidence of acute myocardial infarction was found to be lowest among females in the age groups below and above fifty years of age. However, the protective effect of the oestrogen hormone against cardiovascular disease (CVD) is only evident in reproductive-age women. In contrast, for women in menopausal age, the incidence of acute myocardial infarction is equivalent to that of the general female population [25]. The present study reported a significantly higher incidence of acute myocardial infarction among females. Recent studies have indicated that women exhibit a higher rate of adverse outcomes than men, particularly in relation to age, diabetes, and treatment modalities.

In contrast, male patients predominantly present with acute myocardial infarction as the primary risk factor. However, during the onset of menopause, the psychological processes employed by women in determining care-seeking behaviours following an acute myocardial infarction differ from those observed in men [26]. The present study found that seasonal variation was significantly associated with patients who did not have a family history of acute myocardial infarction. Nevertheless, these findings emphasised the lack of awareness among the population regarding the risk factors associated with the initial symptoms of acute myocardial infarction. Conversely, individuals acquainted with these distressing indications are capable of pursuing immediate remedial measures to ensure their survival.

Conclusion

It is concluded that A seasonal pattern has been observed in the admissions for acute myocardial infarction in the community under study. The number of cases increases in winter and decreases in summer. Furthermore, the age of patients has been found to influence the effect of environmental factors on acute myocardial infarction. This phenomenon is most evident among individuals over the age of 65. A greater increase in mortality from acute myocardial infarction is observed during the winter months in elderly individuals compared to younger individuals. Environmental factors may have a significant impact on the triggering of acute cardiovascular events or on determining patients' outcomes.

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