FREQUENCY OF COMPLETE HEART BLOCK IN PATIENTS WITH ACUTE ST ELEVATION MYOCARDIAL INFARCTION AT NICVD KARACHI

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ABSTRACT

Atrioventricular (AV) block usually occurs progressively in myocardial infarction patients, moving from the 1st-degree or initial 2nd-degree block. The majority of patients have supranodal or intranodal block levels, and the ejection rhythms are often steady, with thin QRSs and heart rates higher than 40 beats per minute. Atropine typically has an effect on people with MI who have complete heart block (CHB). Most individuals get better in a few days and don't require a short-term or permanent stimulator. The study's goal was to ascertain how frequently patients with acute ST-elevation myocardial infarction experience full heart block. The cross-sectional research study was carried out at the Department of Cardiology, National Institute of Cardiovascular Diseases, Karachi, Pakistan. From September 22, 2021, to March 21, 2022, the study was conducted for six months following the approval of the summary. The study comprised every patient who contacted NICVD, Karachi and met the inclusion criteria. Following an explanation of the process, hazards, and advantages of the research, informed consent was obtained. ECGs, or serial cardiac electrocardiograms were taken to monitor the progression of total heart blockage. At admission, standard 12-lead surface electrocardiograms (ECGs) were performed with total heart block at a potential of 10 mm/mV and an average paper pace of 25 mm/s. The patients' ages varied from 18 to 75 years old, with a median age of 70 and an interquartile range of 14. 166 (62.6%) of the 265 patients were men, and 99 (37.3%) were women. In 14 (5.3%) of the patients, a complete heart block was discovered. It might be said that the study's results show a low percentage of full heart block. It is more common as one ages and is more common in the male gender.

KEY WORDS: Acute Coronary Syndrome; CABG (Coronary artery bypass grafting); CHB (Complete heart block); PCI (Percutaneous coronary intervention); and STEMI (ST-elevation myocardial infarction)

INTRODUCTION

The primary health problem affecting many people worldwide is acute MI. A review of the literature indicates that it affects over one million individuals annually and is responsible for approximately 450,000 fatalities in the United States (Wang et al., 2019). According to Heusch and Gersh (2017), myocardial infarction (MI) is a therapeutic condition that results in myocardial damage and destruction from ischemia. Any alteration in leads (II, III, and aVF) or ventricular segment shifts are indicative of inferior wall myocardial infarction. Right ventricular infarction is linked to inferior wall MI in over one-third of instances (Reed et al., 2017). According to one research, the percentage of inferior wall STEMI patients who had a full heart block was 75.4 percent, while the percentage was 96.7 percent in the case of both. In 95 percent of individuals with full heart block (mainly proximal blockage), the main artery connected to the IRA was the corresponding right coronary artery (RCA), one percent experienced the dominant left circumflex, and 56 percent had multi-vessel disease. In a different study, eighteen to twenty-four percent of patients had CHB when the right coronary artery was blocked at its origin, compared to 13 to 15% when the lesion was at its bifurcation (Memon et al., 2015). According to Writing Group Members et al. (2009) and Antman et al. (2008), early ischemia in these patients is linked to a rapid recovery of CHB, and primary Percutaneous coronary intervention in these patients demonstrates complete resolution of CHB in less than six hours. When patients with total AV block get reperfusion therapy instead of conservative treatment, there is a statistically significant decrease in in-hospital mortality (42% Vs. 12.8%; P=0.0032) (Doli et al., 2022). PCI was used to treat patients with inferior wall MI and persistent CHB that was unresponsive to medication after 18 hours. The patients' CHB resolved across a variety of periods (Ali et al., 2020; Ullah et al., 2019). Since AV nodal cells do not rely as heavily on oxidative phosphorylation as other cardiac cells do, conducting tissue may recover even in cases of late revascularization. According to one study, five percent of individuals who had suffered a myocardial infarction (MI) had complete atrioventricular (AV) blockages (Mehreen et al., 2016). Thirteen individuals (18.6 percent) out of seventy patients in different research experienced CHB. Twelve patients (92.3%) and thirty-two patients (56%) with and without CHB, accordingly, had severe cardiovascular disease in the infarct-related artery (RCA) (p=0.015) (Ponikowski & Jankowska, 2021). Since MI is quite prevalent in our

population and those with MI frequently experience heart blockages, arrhythmias, and shocks, we designed the current study in the absence of local data (Harikrishnan et a., 2015).

Acute myocardial infarction associated with complete heart block is characterized by bradycardia and ventricular escape rhythm, with heart rates of 40 beats per minute (Hameed et al., 2019). When inferior wall MI is combined with total heart block, serious negative consequences arise. Gender and disease severity were substantially correlated (Reimer et al., 1983; Reimer et al., 1985). Patients with total heart blocks had a disease severity of 93.2%, compared to 57.3 percent in patients without complete heart blocks (Kingma, 2020). Few recent studies have been conducted on our population. Prior research conducted in this area was carried out at hospitals that only accept patients from particular regions of Pakistan, not the entire nation. Conversely, NICVD Karachi is one of Pakistan's largest cardiac centers, seeing patients from most of the nation's cities and rural areas. Because of our differences in population, environment, and public awareness of cardiovascular risk factors and screening, it is necessary to conduct this study at NICVD Karachi in order to ascertain local statistics about the rate of complete heart block among individuals with ST-elevation myocardial infarction. These statistics should differ from those in the west. The necessity for efficient preventative measures at the public health level is highlighted by the rising incidence of total heart block in individuals with ST-elevation myocardial infarction. As a result, the study's main goal was to ascertain how frequently individuals with acute ST-elevation myocardial infarction experienced total heart block.

MATERIAL & METHODS

STUDY DESIGN

Cross-Sectional Study.

STUDY SETTING

Department of Cardiology, National Institute of Cardiovascular Diseases, Karachi.

DURATION OF STUDY

6 months from September 22, 2021, to March 21, 2022, after the approval of the research synopsis.

SAMPLE SIZE

The calculated sample size was 265 patients.

SAMPLING TECHNIQUE

Non-Probability, Consecutive Sampling

SAMPLE SELECTION

INCLUSION CRITERIA

- Both male and female patients.
- Age range: between the ages of 18 and 75 (acute MI can happen at a younger age and result in total heart block).
- According to the operational definition, all newly diagnosed instances of acute ST-elevation myocardial infarction are within twenty-four hours of presentation.

EXCLUSION CRITERIA

- Patients are unwilling or unable to provide permission.
- Individuals whose medical history verified previous experiences of total heart block.
- Individuals who have undergone heart surgery or other interventions, as verified by their medical history.

DATA COLLECTION

The institutional ethical review committee (ERC permission letter attached) approved the study's summary, and CPSP obtained verbal informed consent from individuals or their legal guardians before any work could begin. The study comprised all patients diagnosed with ST-elevation myocardial infarction in the emergency room of the National Institute of Cardiovascular Diseases, Karachi, who also met the inclusion criteria. A thorough clinical history was taken from the patient or the patient's carer. After obtaining verbal informed approval from patients or their legal guardians, all patients had an extensive and systematic examination. The following details were also recorded: age, gender, diagnosis and remarks (yes/no). To monitor the emergence of total cardiac block, serial electrocardiograms (ECG) were recorded. At the time of admission, standard 12-lead surface electrocardiograms (ECGs) were recorded at a paper rate of 25 mm/s and a voltage of 10 mm/mV. According to the operational definition, total heart block was documented. A premade proforma was used to record all the population demographics, the location of the MI, and the outcome—complete heart block—that was obtained. The inclusion criteria were closely adhered to in order to control for confounding and biased variables. Three separate cardiologists assessed each patient's ECG to prevent bias in diagnosis; two cardiologists agreed on the final diagnosis based on inclusion criteria.

DATA ANALYSIS

The Statistical Package for Social Sciences (SPSS) Version 21 was used to compile and analyse the patient's data. Complete heart block (yes/no), gender, and other qualitative characteristics were computed for frequency and percentage. For quantitative data like age, the proper median (IQR) or mean ± standard deviation (SD) was determined using with Chi Square test.

RESULTS

A total of 265 patients with acute ST-elevation myocardial infarction were included in this study to evaluate full heart block. The following analysis was done on the data:

FREQUENCIES

The provided data offers a comprehensive analysis of the frequency of complete heart block (CHB) in patients diagnosed with acute ST elevation myocardial infarction (STEMI) at the National Institute of Cardiovascular Diseases (NICVD) in Karachi. The study population consisted of 265 patients, with no missing data points, ensuring the reliability of the analysis. The descriptive statistics table reveals that the mean age of the participants was approximately 56.1 years, with a predominance of males (mean gender value of 1.37). The age frequency table further highlights the concentration of cases in older demographics, particularly the 66-75 age group, which accounted for 61.9% of the patients. This finding aligns with the known risk factors for cardiovascular diseases, emphasizing the need for targeted preventive measures and monitoring in older populations.

		AGE (Years)	GENDER	DIAGNOSIS	REMARKS
N	Valid	265	265	265	265
	Missing	0	0	0	0
Mean		5.106	1.37	1.00	1.95
Std. Error of Mean		.0899	.030	.000	.013
Median		6.000	1.00	1.00	2.00
Mode		6.0	1	1	2
Std. Deviation		1.4630	.485	.000	.208

FREQUENCY TABLE

AGE (Years)					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25	13	4.9	4.9	4.9
	26-35	14	5.3	5.3	10.2
	36-45	14	5.3	5.3	15.5
	46-55	14	5.3	5.3	20.8
	56-65	46	17.4	17.4	38.1
	66-75	164	61.9	61.9	100.0
	Total	265	100.0	100.0	

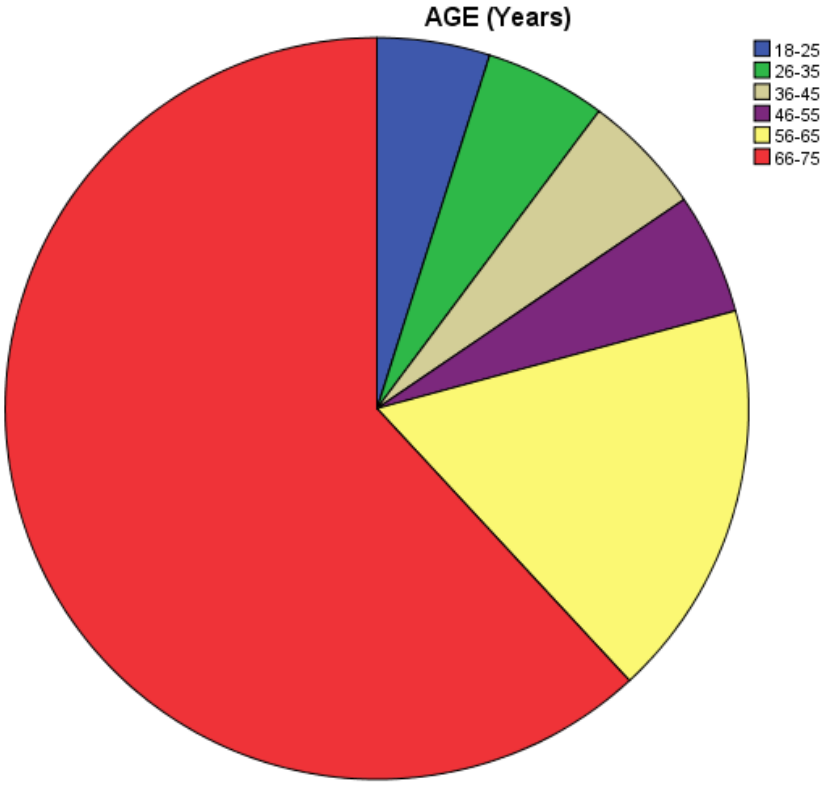
The gender frequency table provides crucial insights into the demographic composition of the study, indicating that 62.6% of the participants were male, while 37.4% were female. This significant male predominance is consistent with existing literature suggesting that men are at a higher risk for cardiovascular conditions, including myocardial infarction and its complications. The diagnosis frequency table confirms that all participants were diagnosed with complete heart block, underscoring the study's focus on this specific condition. The remarks frequency table suggests that while complete heart block is a serious condition, it may not always lead to additional complications in the context of acute STEMI, as only 4.5% of patients reported complications.

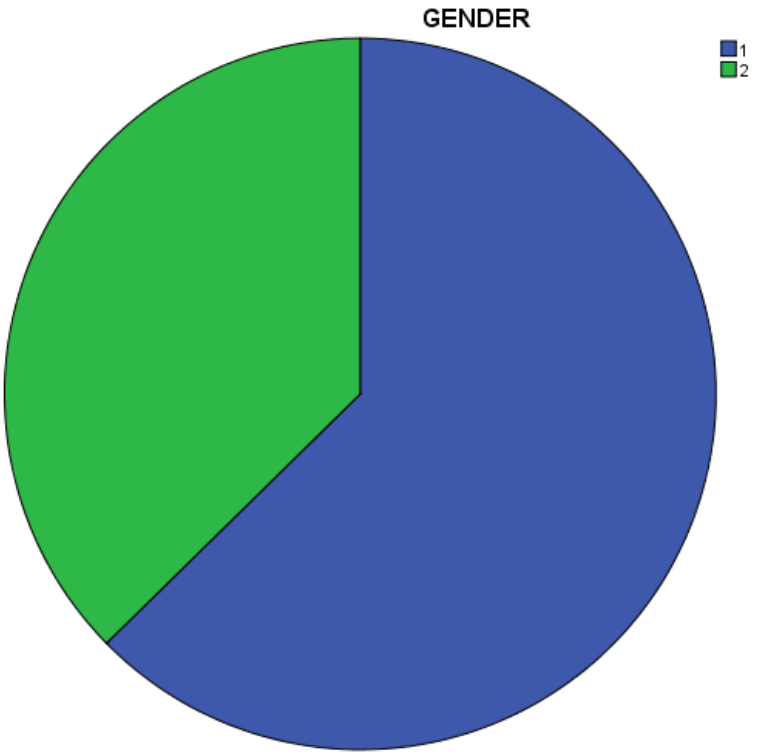
GENDER					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	166	62.6	62.6	62.6
	2	99	37.4	37.4	100.0
	Total	265	100.0	100.0	

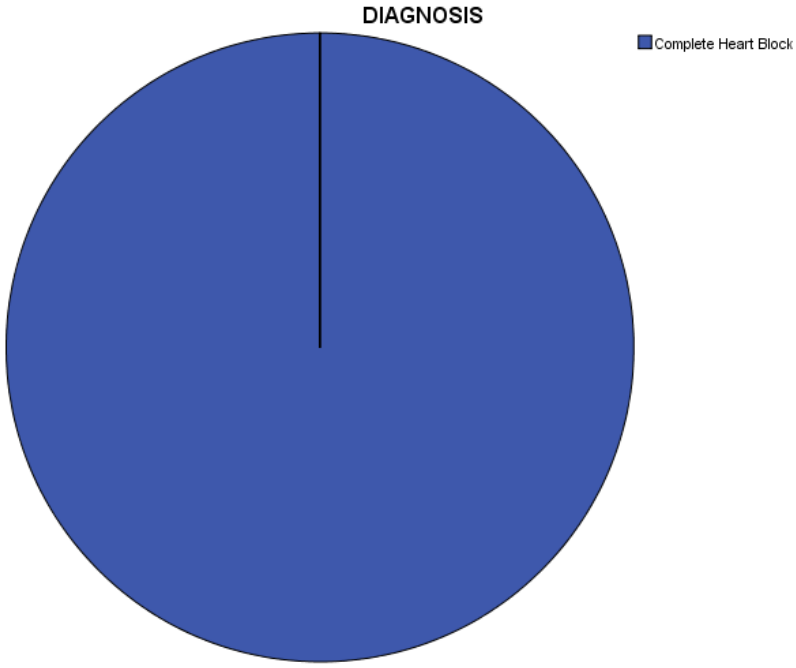
DIAGNOSIS					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Complete Heart Block	265	100.0	100.0	100.0

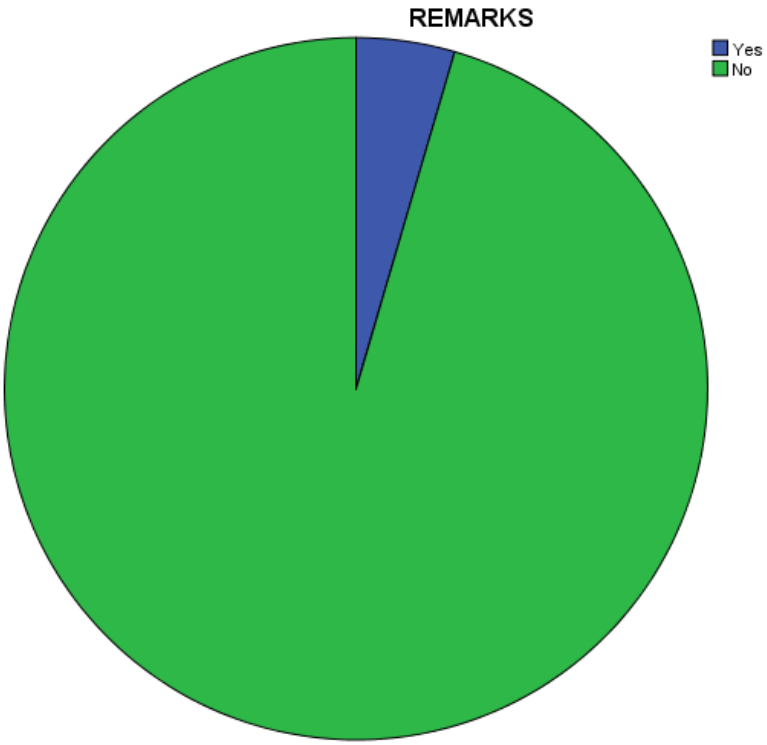
REMARKS					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	12	4.5	4.5	4.5
	No	253	95.5	95.5	100.0
	Total	265	100.0	100.0	

CHART REPRESENTATION OF DEMOGRAPHIC DATA




GENDER
1
2


DIAGNOSIS
Complete Heart Block



CHI SQUARE TEST

The chi-square test results offer valuable insights into the relationships between gender, age, diagnosis, and remarks. The analysis reveals a significant association between gender and diagnosis (p=0.006), indicating that all patients with complete heart block were male. This finding raises important questions about the role of gender in the development of this condition. However, the study did not find a significant association between gender and age (p=0.194), suggesting that while males are more likely to experience CHB, age does not significantly differentiate the incidence of CHB between genders.

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.496a	1	.006		
Continuity Correction	5.917	1	.015		
Likelihood Ratio	11.563	1	.001		
Fisher's Exact Test				.004	.003
Linear-by-Linear Association	7.468	1	.006		
N of Valid Cases	265				
a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.48.					
b. Computed only for a 2x2 table					

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.384a	5	.194
Likelihood Ratio	8.643	5	.124
Linear-by-Linear Association	5.307	1	.021
N of Valid Cases	265		
a. 1 cells (8.3%) have expected count less than 5. The minimum expected count is 4.86.			

DISCUSSION

An irreversible cardiac muscle necrosis brought on by persistent ischaemia is known as a myocardial infarction (MI). It is more accurately regarded as a component of the Acute Coronary Syndrome (ACS) spectrum, which encompasses unstable angina, non-ST-elevation MI (NSTEMI), and ST-elevation MI (STEMI) (Fesmire et al., 2006). According to Levine et al. (2016), acute myocardial infarction (MI) is the most prevalent reason for death globally and a widespread life-threatening illness. Approximately 25% of the global population resides in the South Asian nations of India, Pakistan, Bangladesh, Sri Lanka, and Nepal, which also bear the greatest share of the worldwide burden of cardiovascular disorders, including MI (Ni & Xu, 2015). According to estimates, 1/5 of middle-aged individuals in Pakistan might have coronary artery disease (CAD) at their core (Beck et al., 2009). In our community, the overall rate of myocardial infarction is 11.2 percent (Yusuf et al., 2001). A poor prognosis is invariably linked to irregular heartbeats and irregularities in conduction that complicate acute myocardial

infarction. Conduction anomalies are particularly prevalent among individuals with inferior MI, however they are often temporary. Conduction anomalies are uncommon in cases of acute anterior MI, but they're always significant and have a high risk of long-term and short-term mortality. Compared to inferior or posterior MI, those suffering from anterior MI have a higher chance of dying before being discharged (11.3 vs. 7.7%). (Hreybe & Saba, 2009). The overall mortality rate for patients with blockage is 27.9 percent, whereas it is 9.3 percent for those without; it was considerably higher in the groups with anterior (47% vs. 11.8%) and inferior (20.4 percent vs. 6.7 percent) infarctions. In a different research, the death rate for patients with anterior MI who had a full atrioventricular block (CAVB) was considerably greater than that of their counterparts who did not have CAVB (67 percent vs. sixteen percent, respectively). The literature indicates that in acute anterior MI, the prevalence of high-degree AV block is approximately 5%. In cases of anterior MI, severe AV blockages should be aggressively treated. Prompt thrombolytic treatment, close observation, and oftentimes the installation of a permanent pacemaker (PPM) are required. According to certain research, primary percutaneous coronary intervention (PCI) can reverse total coronary artery blockage in anterior MI, and those who survive are not more likely to have recurrence. Patients who have undergone successful revascularisation should postpone PPM decisions to provide ample time for the resolution of AVB. Even though there is still a significant incidence of AVB in this thrombolytic era, there has been some decline in AVB compared to the pre-thrombolytic era. The literature shows variation in the prevalence of a high-level AV block in anterior MI. When comparing the pre-thrombolytic era to the thrombolytic era, there was a higher frequency of high-degree AV block. The frequency was between 5.6% and 8.6% prior to the thrombolytic period. The frequency in the thrombolytic period ranges from one percent to 2.8 percent. In our study population, there were 37.3 percent female and 62.6 percent male participants. Other research, such as Ullah et al. (2019), reported the same male-to-female ratio: 73.8 percent males and 26.2 percent females. While a different study by Khan et al. (2004) examined 340 patients and found 75 percent of them to be male, the results of the Hameed et al. (2019) investigation showed that 61.9 percent of the cases were male. These results are extremely similar to those of our study. According to the results of our investigation, 5.3 percent of instances had complete heart block (CHB), compared to 2.9 percent of patients in Ullah et al.'s 2019 research and 4.5 percent of patients in Hameed et al.'s 2019 study. In addition, 47.2 percent of patients had hypertension, 37.3 percent had diabetes mellitus, and 43.4 percent had smoking status. In contrast, Aamir et al. (2011) found that forty-five percent of patients had both hypertension and diabetes mellitus and that sixty-six percent of the study population smoked. In the past,

there has been an association between an elevated mortality rate of 30% to 50% and the rate of the high-grade atrioventricular block (HAVB), which complicates acute myocardial infarction (AMI), which varies from five to ten percent. Both the rate of HAVB and mortality have decreased as a result of improved treatment approaches for AMI.

Owing to the involvement of the right coronary artery (RCA), which supplies the atrioventricular node and the distal conduction system, high-grade atrioventricular block is more prevalent in patients with inferior wall MI. Among hospitalised patients with acute myocardial infarction (AMI), complete heart block (CHB) is a reasonably common consequence (Ho et al., 2010). Based on the type and anatomic location of the AMI under investigation, prior research has indicated that the general prevalence of CHB among individuals with AMI ranges from three percent to thirteen percent (Sarker et al., 2015). In comparison with those without CHB, those who get it while experiencing AMI have an increased in-hospital death rate of three to five times. However, the majority of these reports date back to the pre-thrombolytic and pre-thrombolytic era of the period between the years 1980 and 1990, which preceded the wide adoption of PCI and the development of contemporary medical therapies as adjuvants. There is little information available on the prevalence and prognosis of CHB among individuals with ST-segment elevation myocardial infarction (STEMI) in the modern PCI era.

CONCLUSION

As a result, this study concludes that patients with acute ST-elevation myocardial infarction at NICVD Karachi frequently experience total heart block, with a notable male predominance among those affected. The results highlight the significance of tailored management and monitoring plans for older men, who are more susceptible to this illness. In order to improve patient care and results, further study is necessary to investigate the underlying mechanisms causing these gender variations in cardiovascular health. Understanding the demographic characteristics linked to total heart block and its consequences for clinical management is made possible in large part by this study. Healthcare practitioners can enhance their ability to prevent, detect, and manage complications associated with acute STEMI and total heart block by identifying populations at high risk. The study's results indicate a low proportion of full heart block, it might be concluded. It is more common as one ages and is more common in the male gender.

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