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FREQUENCY OF COMPLETE HEART BLOCK IN PATIENT WITH ACUTE MYOCARDIAL INFARCTION AND THEIR SHORT-TERM OUTCOMES

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Abstract

Objective: *To to determine the frequency of complete heart block and outcomes in patient presenting with acute myocardial infarction.*

Study design: longitudinal study

Place of study: *Department of cardiology, Liaquat Universities of Medical health sciences, Jamshoro*

Methodology: *All newly diagnosed MI patients were included. Detailed history followed by detailed clinical examination was done. ECGs were done. Complete heart block was evaluated. It was considered as third degree AV block and was diagnosed when there was no AV nodal conduction and the P wave was completely dissociated from the QRS complexes. All patients were further followed up till discharge to assess the occurrence of arrhythmia and mortality. All this information was recorded on Performa. Data was analyzed using SPSS version-25 and was stratified among age, gender, obesity, smoking, hypertension and Diabetes by applying chi square test.*

Results: *The mean age of the patients was 60.83 ± 10.37 years. The gender distribution showed 139 (58.8%) males and 98 (41.1%) females. Complete Heart Block found in 42 (17.7%) cases of Acute Myocardial Infarction. Among 42 patients, arrhythmia observed in 5 (12%) cases and mortality in 7 (16.6%) cases. Further complete heart block was also stratified with respect to baseline characteristics; significant difference was observed*

Conclusion: *Frequency of complete heart block is high in patients with myocardial infarction*

INTRODUCTION

Acute MI is the leading health issue globally affecting many lives[1]. According to literature review, almost 450,000 deaths occurred in developed countries because of it while it affects more than one million people per year around the world[2, 3]. Myocardial infarction (MI) is a clinical event that causes myocardial injury followed by necrosis due to its ischemia. Inferior wall myocardial infarction is characterized by ST segment shifts or any change in leads (II, III and aVF). In more than one third of cases inferior wall MI is associated with right ventricular infarction[4, 5].

The presence of conduction defects complicates AMI frequently and is associated with increased short- and long-term mortality rates. Thrombolytic therapy, although, has been established to reduce the mortality in AMI however its role in reducing the incidence of conduction defects is less clearly defined. Complications associated with conduction defects have remained unchanged[6]. The most commonly

observed conduction defects after acute MI include atrioventricular nodal blocks (1st, 2nd and 3rd degree) and intraventricular conduction defects (right or left bundle branch block). In some cases fascicular blocks (anterior and posterior hemi-blocks) alone or in combination with right bundle branch block (bi-fascicular blocks) are also observed. The occurrence of complete heart block in AWMI is important because it indicates that infarction is extensive and may result in cardiac failure or death[7],[8].

Risk factors are often shown to be strongly connected with each other while preventive ones are found to be correlated. We can say that those who already have significant health risks are more prone to get additional risk factors, and that they are fewer prone to always have prevention strategies[9]. However, the presence of CHB points to seriously jeopardized AV conduction which could result in sudden extremely slow heart rates or a systolic arrest[10].

The aim of our study was to determine the frequency of complete heart block and outcomes in patient presenting with acute myocardial infarction. Currently available literature focusing on type of MI and its associated outcomes. Very few studies are available which focusing on complete heart block and its outcome in patient with acute myocardial infarction. Available literature suggested that patient with AMI having complete heart block had poor prognosis. Findings of our study would help in assessing the local burden and also help the cardiologist in risk stratification of patient.

Methodology:

This study was carried out over a period of six months after the approval of research protocol from ethical review committee of the hospital. Sample size was calculated by using WHO sample size calculator and taking the frequency of complete heart block in AMI i.e. 19%[1], margin of error =5%, confidence interval = 95%, then calculated sample size was 237. After taking written informed consent, a total of 237 patientsof either gender in the age range of 18-65 years presented with acute Myocardial infarction within 3 hours of development of symptoms were included via non-probability sampling technique.Patient with recurrent myocardial infarction, patient with prior history of PCI or CABG, renal failure, chronic liver disease, arrhythmia were excluded. Pregnant women and patient with pacemaker were also excluded. Standard 12 lead ECG recorded before/after admission was used to confirm diagnosis of acute MI. Presence or absence of complete heart block as made with standard 12 lead ECG at the time of admission and cardiac monitoring during hospital stay. Complete heart block was characterized as positive if ECG showed severe bradycardia (HR <40/min) due to absence of AV conduction and ECG demonstrated complete AV dissociation (independent beating of the atria and ventricles). All patients with acute myocardial infarction were managed as per hospital protocol were followed till discharge to assess the occurrence of arrythmia and death. Discharged criteria was if patient was hemodynamically stable i.e. systolic blood pressure < 90 mmHg or mean arterial pressure (MAP) < 70 mm Hg) and heart rate ≥ 100 bpm, patient was pain free (will and no post procedure complication like hematoma or bleeding.

Data analyzed using standard Statistical Package for Social Sciences (SPSS version26.0)statistical software Quantitative variables were presented as mean and standard deviation or median (IQR). Qualitative variables were presented as frequency and percentage. Effect modifiers such as age, gender, diabetes, hypertension, smoking and obesity were controlled through stratification. Post stratification chi-square/Fischer exact test was applied by taking p-value ≤0.05 as significant.

Results:

In this study, a total of 237 patients of acute MI were enrolled. The mean age of the patients was 60.83 ± 10.37 years. The gender distribution showed 139 (58.8%) males and 98 (41.1%) females. Regarding smoking habits, 21 (9%) were smokers, other characteristics, such as hypertension found in 126 (53.16%) cases , obesity 92 (39%) cases, and diabetes 116 (49%) cases, **as shown in table#1**.

Table#1: Baseline Data of the patients (n=237)

Data	Mean ± SD/n(%)
Age (Years)	60.83 ± 10.37
Gender	
• Male	139 (58.88%)
• Female	98 (41.11%)
Smoking;	
• Yes	21 (9%)
• No	216 (91%)
Obesity:	
• Yes	92 (39%)
• No	145 (61%)
Hypertension	
• Yes	126 (53.16%)
• No	111 (46.8%)
Diabetes Mellitus	
• Yes	116 (49%)
• No	121 (51%)

Complete Heart Block found in 42 (17.7%) cases of Acute Myocardial Infarction. Among 42 patients, arrhythmia observed in 5 (12%) cases and mortality in 7 (16.6%) cases. Further complete heart block was also stratified with respect to baseline characteristics; significant difference was observed, **as shown in table#2 &3**.

Table #2: Frequency of Complete Heart Block in Patient with Acute Myocardial Infarction and their Short-Term Outcomes

Parameters	n (%)
Complete Heart Block	
• Yes	42 (17.7%)
• No	195 (82.3%)
(n=42)	
Arrhythmia	
• Yes	5 (12%)
• No	37 (88%)
Mortality	
• Yes	7 (16.6%)
• No	35 (83.3%)

Table #3: Frequency of Complete Heart Block in Patient with Acute Myocardial Infarction and their Short-Term Outcomes

Data	Complete Heart Block		P-value
	Yes (n=42)	No (n=195)	
Age (Years)			

• 18-45 • >45-80	2 40	33 162	0.04
Gender • Male • Female	33 09	106 89	0.003
Smoking; • Yes • No	19 23	02 193	0.00
Obesity: • Yes • No	37 05	55 140	0.00
Hypertension • Yes • No	39 03	87 108	0.00
Diabetes Mellitus • Yes • No	34 08	82 113	0.00

Discussion:

A myocardial infarction (MI) arises as a consequence of atherosclerotic plaque building in the endometrial lining of the coronary artery, leading to abrupt plaque rupture and disastrous thrombus formation. This prevents blood flow downstream by causing total arterial closure. The ischemic cascade is set off by prolonged impaired blood flow, which results in myocardial infarction inside the blocked coronary zone. Within 15 to 30 minutes of the coronary blood supply being blocked, this starts an intracellular cascade that includes necrosis and apoptosis.[1-3] Over the next three to four hours, the first infarction cascade develops, resulting in alterations in gross pathology. Notably, the presence or lack of Q-waves on an ECG recording at that moment cannot anticipate these changes.[4-6] Subsequent tissue death and scarring disrupt normal conduction routes, drastically weakening afflicted locations. People are at risk for heart block (CHB), ventricular aneurysms, post-infarction myocarditis, irregular heart rhythms (arrhythmias), and heart wall rupture with disastrous outcomes due to the exact size and location of the MI.[5-7]

Following operational definitions and inclusion criteria, this study included 237 patients to determine the prevalence of CHB in patients who presented with acute myocardial infarction (MI). MI is still a major public health concern in underdeveloped nations, despite improvements in diagnosis and treatment.[8]

The overall frequency of complete heart block in our sample was 17.7%, and there was a strong correlation between age and CHB. Additionally, data indicates that AV blockages are rather common in patients who arrive at the hospital late, highlighting the significance of treating STEMI patients as soon as possible. Although we did not look at presentation time, the older population is likely one factor contributing to the high incidence of CHB in our study. While the majority of the other studies included comparatively younger populations, the population's mean age was 60.83 ± 10.37.[11-12] Previous research has also shown that older adults are more likely to develop AV blocks.[12] A local study earlier found lower percentages (13.9%) of total AV block, although the sample cohort was young, with 139 patients (58.88%) being male.

The mean age of the patients in another research at the time of MI was 50.55 ± 6.72 years. Male patients made up the majority (82.1%), with female patients making up 17.9%. Their results showed that frequency of CHB in acute ST segment elevation MI was 7.3%. Our study's findings showed no correlation with any other clinical feature that may be used to define this illness.[13] Therefore, it is imperative that we implement protocols in our standard clinical settings to address life-threatening illnesses. The rate of total

heart block following STEMI ranges from 2.9 to 12.8%, according to another study. According to reports, the rate of total heart block following STEMI in Pakistan ranges from 2.9 to 11.8%; this rate is lower than the one found in our study.[14]

One earlier study found that 28% of its patients (54/193) had CHB with inferior wall MI.[15] Although seven of their patients passed away while in the hospital, indicating a high mortality risk among CHB patients with a p-value of 0.009.

Multivariate analysis identified age, male sex, presence in health region four, and comorbidities like hypertension and diabetes as risk factors for acute MI.[16] In this study, the mean age was 55.98±12.224, with 65.6% males and 34.4% females. Distinct lifestyles and behavioral patterns between genders, such as smoking habits, predispose males to higher cardiovascular risks.15The study revealed 25.8% smokers 30.3% hypertensive , 33.2% obese and 23.8% diabetics. Of the total, 17.7% presented with complete heart block, while 16.6% experienced in-hospital expiries and 12% Arrythmia. These findings align with a study conducted byAccording to Hashim M. et al.7, people with possible risk factors such diabetes, obesity, dyslipidemia, and smoking have a higher prevalence of CHB.17 Understanding physiological pathways in CHB formation in AMI is critical for recognizing and controlling potentiating issues.[18]

The prevalence of CHB with MI is approximately 12%, according to a literature review on the condition in western nations.19 In contrast, the incidence of ACS with complete heart block is between 21 and 30% in our settings because of our sedentary lifestyle and fatty diet. Consequently, prior research has shown that mortality is rising and quality of life is declining in our area.[20,21] Therefore, the moment has come for us to stand up against life that has been crippled by inactivity. Exercise should be implemented, and health policies should be updated.

The main limitation of the study was that this was a single institution study in which we found the frequency of complete heart block after acute ST segment elevation myocardial infarction to be 17.7%. The strength of the study is that data was collected employing rigour and a relatively appropriate sample size. Data of such patients over a longer duration of time in many centers would have given more strength to this study. But nonetheless it alludes towards the different outcomes as given in the results.

Conclusion:

Frequency of complete heart block is high in patients with myocardial infarction. Its occurrence increases significantly with aging and also face increased mortality risks. Timely detection, resource allocation, and treatment are crucial to mitigate adverse outcomes.

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