International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 13, No. 10, October 2024 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_13.10.2024.29

ORIGINAL RESEARCH

Clinical study of conduction block in acutest elevation myocardial infarction

Dr. Sangeeta Gill[1], Dr. Kashmir Singh[2], Dr. Hardip Singh Nirman[3], Dr. Satpal Aloona[4], Dr. Ramandeep Verma[5], Dr. Arshia Dhingra[6]

[1,5,6]Junior Resident, [2]Assistant Professor, [3,4]Professor, Department of Medicine, Guru Nanak Dev Hospital, Amritsar, Punjab, India

Corresponding Author
Dr. Kashmir Singh
Assistant Professor, Department of Medicine, Guru Nanak Dev Hospital, Amritsar, Punjab, India
Email: dr.karan25m@gmail.com

Received Date: 5 August, 2024 Accepted Date: 19 September, 2024

ABSTRACT

Acute Myocardial infarction (AMI) is one of the most fatal diseases of human community. Its incidence is almost 2-3 times more in Indian ethnicity. Electrocardiogram is the most useful and feasible diagnostic tool for the initial evaluation, early risk stratification triage, and guidance of therapy in patients who have chest pain. Myocardial infarction leads to complications like mechanical and electrical abnormalities. Conduction blocks are seen in myocardial infarction, more commonly in Inferior wall infarction because of proximity of conduction system. **Aim**: This study is undertaken to evaluate various patterns of conduction blocks occurring in Acute myocardial infarction. It also corelates risk factors like diabetes mellitus and site of infarction. **Material and methods**: 100 cases of Acute myocardial infarction (AMI) admitted in Guru Nanak Dev hospital attached to Govt. Medical College Amritsar were included in this observational study. **Results**: Among 100 patients, 29 patients (29%) developed conduction blocks. 8 patients (8%) developed first-degree AV block. 7 patients (7%) developed second – degree AV block. 6 patients (6%) developed third-degree AV block. patients (2%) developed left anterior hemiblock (LAHB). 2 patients (2%) developed RBBB and 2 had complete RBBB+LAHB. 1 patient had LBBB and 1 had SA block. **Conclusion**: Myocardial infarction is common in the age group of 51-60 years. 29% of patients with MI developed conduction blocks. Diabetes and hypertension were significant comorbidities. Mortality is more in patients with conduction blocks when compared to patients without conduction blocks (P = 0.031).

INTRODUCTION

Acute myocardial infarction (AMI) is a leading cause of death and disability worldwide. The global burden of cardiovascular diseases, including AMI, has been escalating, and account for approximately 31% of all global Deaths[1]. ST-elevation myocardial infarction (STEMI) is a severe form of acute myocardial infarction, that occurs when there is a complete occlusion of a coronary artery. This occlusion is usually due to therupture of an atherosclerotic plaque, which triggers the formation of a blood clot (thrombus).[2] Many risk factors are reported important for the development of myocardial infarction, including lifestyle factors, environmental factors, psychosocial factors, genetic factors, etc. The main risk factors for MI include genetic susceptibility and non-genetic factors such as hypertension, diabetes, obesity and lifestyle. Many studies have shown that smoking is not only a risk factor for the onset of MI but also a predictor of a poor prognosis for MI.[3-6] Acute myocardial infarction is often characterized by generalized autonomic dysfunction, which leads to enhanced automaticity of the myocardium and the conduction system. This dysfunction is exacerbated by electrolyte imbalances and ongoing ischemia, resulting in hypoxia of the conduction system. These factors contribute to the development of conduction blocks.[7-8] In the context of ST-elevation myocardial infarction (STEMI), conduction abnormalities can manifest in various forms, including bundle branch blocks, AV blocks, and intraventricular conduction delays.[9-10] These disturbances arise from myocardial injury or ischemia involving the specialized conduction system, which includes the sinoatrial (SA) node, AV node, bundle of His, and the right and left bundlebranches.[7-8] The type and severity of conduction disturbances depend on the location and extent of infract and the presence of any pre-existing conduction disease[9].Various types of Conduction block developed following AMI. Out of 100 cases of STEMI, 29 cases were STEMI with conduction block.Out of 29 cases of CB, 8 cases(27.58%) were first degree AV block, 6 cases(20.68%) of CHB, 3 cases (10.43%) of second degree (Mobitz type 1), 2

DOI: 10.69605/ijlbpr_13.10.2024.29

cases of second degree (Mobitz type 2) (6.89%) and 2:1 AV Block (6.89%)each, 2 cases (6.89%) of RBBB, 1case of LBBB, 2 cases of each LAHB(6.89) and RBBB+LAHB (6.89%) and 1 case(3.44%) of SA Block.

The development of BBB, complete AV Block is associated with poor prognosis likely owing to the extensive nature of the infarction.[11]

Conduction defects frequently complicateacute myocardial infarction (MI) and are associated with heightened short-term mortality. BBB in AMI significantly worsen prognosis due to extensive myocardial damage and increased risk of ventricular asystole.[12] Early interventions such as thrombolytic therapy and percutaneous coronary intervention (PCI) have been established to reduce mortality by restoring myocardial perfusion and limiting infarct[13]

This study is undertaken to understand various patterns of conduction blocks occurring in various ST segment elevation myocardial infarction patients and its prognostic implications at tertiary care hospital.

AIMS & OBJECTIVES

1. To study the incidence of conduction block in acute ST elevation myocardialinfarction.
2. To study various patterns of conduction blocks occurring in acute myocardial infarction.
3. To study the prognostic implications of conduction blocks occurring in acute myocardial infarction.

MATERIALS AND METHODS

This is a cross-sectional study, comprising of 100 patients diagnosed with acute STEMI admitted at Guru Nanak Dev hospital attached to Govt. Medical College Amritsar.

Place of Study

Guru Nanak Dev Hospital, attached to Govt Medical College Amritsar, Punjab.

Study Population

Conduction abnormalities in Patients presenting with AMI.

Period of Study

The study period is from 2023 to 2024.

Before the commencement of the study, permission was obtained from thedepartment with an approval of the protocol of the study. All enrolled patients were informed about the nature of the study and their rights to refuse. Their written consent was taken before including them in the study.

A detailed history was taken about the chest pain, the presence and duration of risk factors and use of different medications. Random venous blood sample was obtained for analysis of blood glucose, lipid profile, renal function test, and routine blood investigations.

Patient was monitored for serial changes in ECG for 24 hours. Twice daily ECG printout along with any change in type of conduction block and other events was also recorded throughout the hospital stay period.

ECG CRITERIA FOR STEMI

The ST segment must be elevated by at least 1 mm (0.1 mV) above the baseline in at least two contiguous leads.

In leads V2 and V3, the elevation must be at least 2 mm (0.2 mV) in men > 40 years and >2.5 mm in <40 years of men and 1.5 mm (0.15 mV) in women.

Patients fulfilling inclusion and exclusion criteria were enrolled in the study.

INCLUSION CRITERIA

1. Patients having Acute ST elevation myocardial infarction.

EXCLUSION CRITERIA

1. Patients with cardiomyopathy.
2. Patients with congenital or rheumatic heart disease.
3. Patients with history of intake of drugs causing conduction blocks like clonidine, methyl dopa, verapamil, digoxin etc.
4. Prior electrolyte imbalance.

OBSERVATION

This is a cross-sectional study, comprising of100 patients diagnosed with acute STEMI admitted to the Guru Nanak Dev Hospital, Amritsar who presented from 2023 to 2024.

Out Of 100 STEMI patients, 29 patients were noted to have Conduction block.The age of the study group ranged from 30 to >70 years (52.04± 8.66). The majority of the patients belonged to age group of 51-60 years (35.0%). Incidence of MI was found to be more in males. Ratio of male to female was 1.7 : 1. Hypertension was the most common risk factor (60.0%), followed by diabetes (52.0%), smoking(37.0%) and dyslipidemia(22.0%). Hypertension and diabetes were found to be statistically significant comorbidities in STEMI patients with p=0.046 and p=0.029 respectively.

Chest pain was the most common symptom 95 cases(95.0%) followed by Breathlessness (58.0%), diaphoresis(48.0%), palpitations (36.0%), vomitings(31.0%), and syncope (7.0%). With p-value of 0.001 Syncope was seen statistically significant in patients with conduction block.

Anterior STEMI accounted for 45.0% of allcases, whereas inferior STEMI accounted for55.0% of all cases.

First-degree heart block was the most common of all, 8 cases(27.58%), 6 cases (20.68%) of CHB, 3 cases(10.43%) of second degree (Mobitz type 1), 2 cases of second degree (Mobitz type 2) (6.89%) and 2:1 AV Block (6.89%)each, 2 cases (6.89%) of

DOI: 10.69605/ijlbpr_13.10.2024.29

RBBB, 1 case of LBBB, 2 cases of each LAHB(6.89) and RBBB+LAHB (6.89%) and 1 case(3.44%) of SA Block.

The incidence of CB was higher among patients with inferior STEMI than the patient with anterior STEMI. Among patients with AWMI, 11.1% developed AV block and13.3% had IV blocks in contrast to the patient of IWMI where AV blocks were seen in 30.9% compared to IV blocks seen in only 1.8%. The p value =0.002 indicated a statistically significant association between the type ofMI and occurrence of CB.

LVF was the most common complicationnoted, seen in 13% cases. Cardiogenic shock was seen in 4 cases, CHF was seen in 9 cases, 1 case had VSR with cardiogenic shock and 1 case had Mitral Regurgitation.

Out of 100 STEMI patients, percutaneous Coronary Intervention (PCI) was done in 75 cases (75.0%), Thrombolysis followed by PCI was done in 13 cases (13.0%), while Thrombolysis alone was given to 7 cases (7.0%). Permanent pacemaker implantation (PPI) was done in 5 cases (5.0%). The(p=0.001) indicating a statistically significant difference in the type of treatment based on the presence of the CB.

In our study, 96 cases (96.0%) survived, while 4 cases (4.0%) resulted in death. Among the 4 expired patients, 3 patients had STEMI withconduction block (p=0.031) indicating astatistically significant association between the presence of conduction block and the likelihood of death.

DISCUSSION

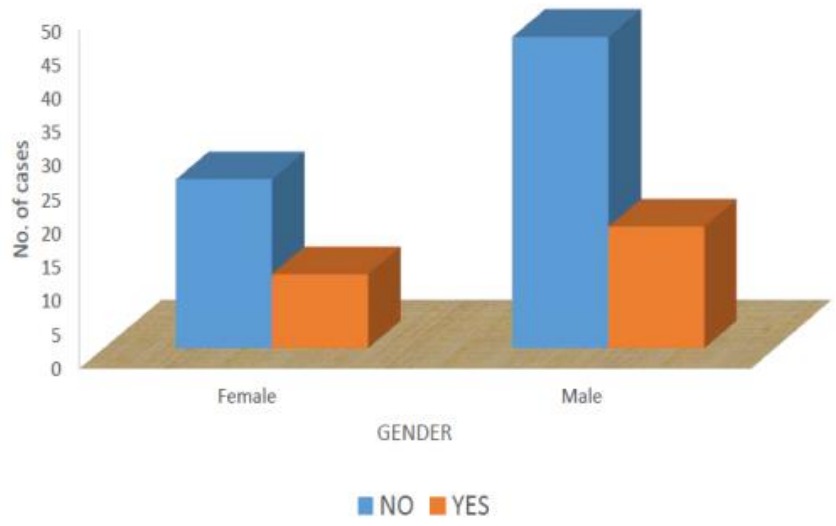
100 patients of STEMI were selected from cases admitted inGuru Nanak Dev Hospital, Amritsar from 2023 to 2024.Out of 100 cases taken into the study, 29 patients were noted to have CB.

AGE

The mean age of the patients in our study was 52.04±8.66 yrs with most commonage group being 51-60 yrs. Similarly, in studies conducted by Yahya et al.[14], AuffretV et al.[15], Shirafkan et al.[16], Neha K et al.[17], the mean age was 59 years, 62 years, 59.6±8.4 years, 65±14 years respectively. The study conducted at Chittagong Medical College Hospital and Lady Reading Hospital Peshawar, the mean age was 54.2 years and 58.8 years respectively.The most common age group in Chittagong study was 51-60 yrs and that in Auffret V et al. was 52-74 yrs.

GENDER

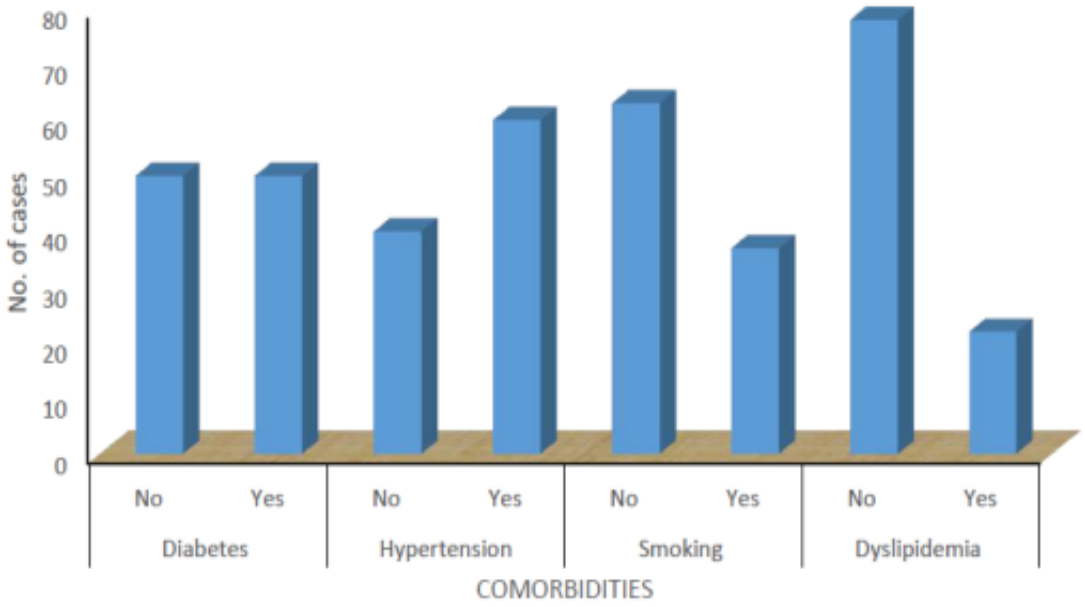
Out of 100 STEMI patients, our study had a male preponderance with 64% males (46 cases were without CB and 18 cases with CB) and 36% females (25 cases without CB and 11 cases with CB). Ratio of male to female was 1.7:1. This was similar to the studies by Auffret V et al.15 (76.3%) and Lady Reading Hospital Peshawar (70%). The p-value of 0.797 indicating no significant association in the occurrence of CB between genders.



RISK FACTORS

Hypertension was found to be the most common comorbidity in our study (60%),followed by Diabetes (50%), Smoking(37%) and Dyslipidemia (22%).Similar results were found in study by Neha K et al.[17] with HTN being the most common comorbidity(48.3%), followed by diabetes mellitus (38.33%) and smoking (26.67%).In contrast, the study at Chittagong MCH found smoking to be the most prevalent comorbidity (67%) followed by HTN and diabetes mellitus. The study by Yahya A et al.[14], diabetes was found to be the most prevalent comorbidity (52.4%).

DOI: 10.69605/ijlbpr_13.10.2024.29



Of 100 patients in the study, 55% patients had features suggestive of IWMI and 45% had AWMI.In contrast, IWMI was seen in 49.5% and AWMI was seen in 51.5% of the patientsin study at Peshawar. In study at Chittagong MCH, only 34% had IWMI and 66%had AWMI.

In our study, 29% of the patients had CBs, out of which 22% had AV block and the rest 7% had IV block. Similar result was observed in study by Swaminathasethupathy R.1[18]where CBs developed in 25% of the patients with AVblocks in 14% and IV blocks in 11%.The studyby Arunprasath et al.58 noted CBs in 19% of the patients with AV blocks in 14% and IV blocks in 5%.

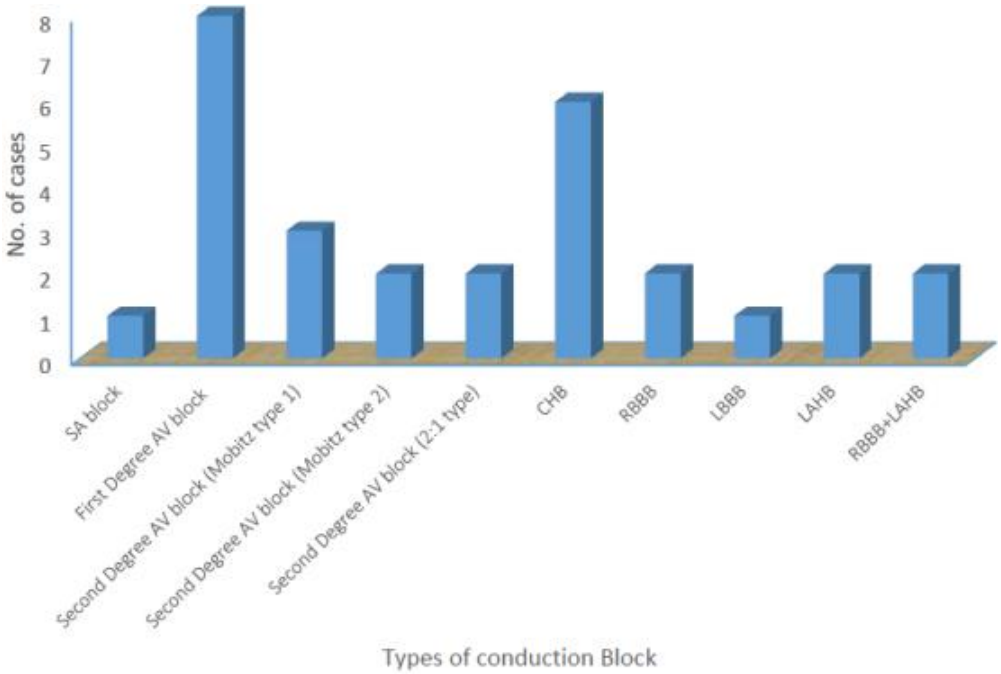
In our study, we found that CBs are more seen in IWMI (18%) than AWMI (11%) similar to the study by Neha K et al.[17] where a higher prevalence of bradyarrythmia was seen in IWMI (71.67%) compared to AWMI (26.67%) and study at Mymensingh MCH whereconduction defects were more prevalent in IWMI (43.5%) compared to AWMI(40.9%).62 Our study noted AV blocks in 22% while Schacham Y et al.[19], Gang UJ et al.[20] and Meine TJ et al.[21] noted AV blocks in only 3%, 3.2% and 6.9% of the patients. The overall prevalence of the heart blocks in study by Shirafkan et al.[16] was 15.8%.

In our study, among patients with AWMI, 11.1% developed AV blocks and 13.3%had IV blocks in contrast to patients of IWMI where AV blocks were seen in 30.9%compared to IV blocks in only 1.8%.The results were similar to the study at LadyReading Hospital in Peshawar where amongthe patients with AWMI, only 3.5%developed AV blocks and 7.1% developed IV blocks, in contrast to patients withIWMI where a higher prevalence of AV blocks was seen in 11.3% compared to IVblocks in only 2.4%.

Out of 29 cases of CB, the first-degree AVB was the most common AVB noted in the present study accounting for 27.58% of the total conduction defects. 6 cases(20.68%) of CHB, 3 cases(10.43%) of second degree (Mobitz type 1), 2 cases of second degree (Mobitz type 2) (6.89%) and 2:1 AV Block (6.89%) each, 2 cases (6.89%) of RBBB, 1 case of LBBB, 2 cases of each LAHB (6.89) and RBBB+LAHB (6.89%) and 1 case(3.44%) of SA Block. The similar observation wasmade in study conducted by Arunprasath D et al.[22] in 2021 where out of 19%, 7 cases were first degree AV block, 4 cases of second degree AV block, 3 cases of CHB, 2 cases of LAHB, 2 cases of RBBB and 1 case of LBBB. Likewise similar results were in study conducted by Swaminathasethupathy R.[18], in RMMCH, Chidambaram tamil Nadu where out of 25%, first degree AV block being the mostcommon (7%), 4% developed second degree Av block, 3% developed third degree AV block, 4% developed left anterior hemiblock, 3% developed right bundle branch, 3% developed left bundle branch block, and 1% developed RBBB+LAHB.LPHB was not seen in our study, As stated by Basualdo et al.[23] the posterior division of the left bundle is relatively short and thick and hence is less exposed to mechanical trauma than its anterior counterpart.

In addition, the posterior division of the left bundle probably receives a double blood supply from both the left anterior descending and the right coronary arteries. These anatomical considerations explain the fact that LPHB is an infrequent complication of AMI.

DOI: 10.69605/ijlbpr_13.10.2024.29



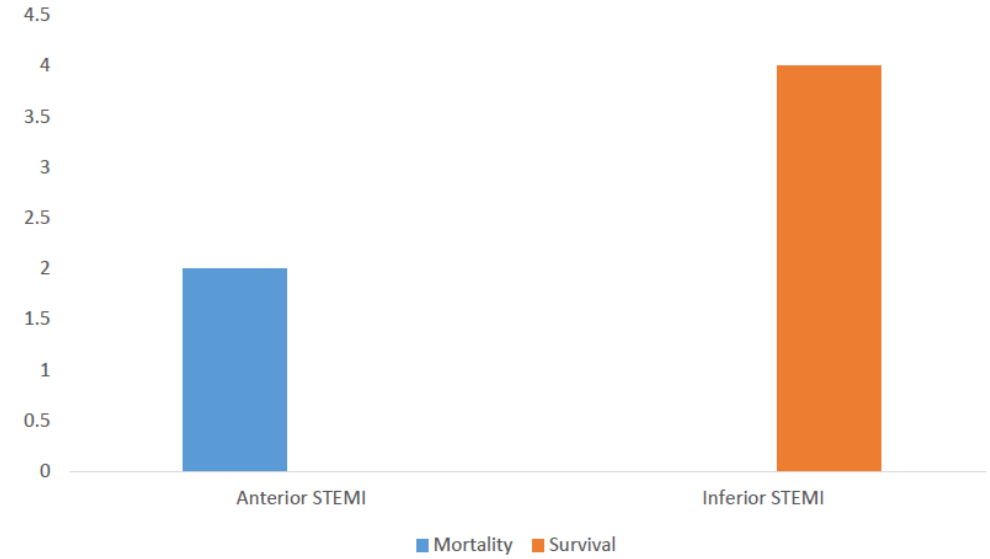
SYMPTOMS AND SIGNS

Chest pain was the most common symptom overall and was noted in 95 cases(95.0%). Followed by Breathlessness, diaphoresis, palpitations, vomitings, and syncope/giddiness were also seen in STEMI patients.The probable reason for breathlessness and other symptoms could be explained by the severity of the nature of disease.

These patients are bound to have large areas of myocardium at risk, more significant LV dysfunction. Hence, these patients were likely to have symptoms of low cardiac output suchas breathlessness, palpitations, vomitings, and giddiness.

OUTCOME OF STEMI WITH CHB

Out of total 6 cases of STEMI with CHB, 2 cases (33.4%) had AWMI and both showed mortality while the rest 4 cases had IWMI with no mortality. The p-value=0.014, statistically significant indicating the presence of CHB in AWMI are associatedwith extensive infarction, potentially leading to death. Similarly, Nguyen et al., in their study, showed that patients with AMI whodeveloped third-degree heart block had greater in-hospital mortality than did those who did not develop CHB (43.2% vs. 13.0%). This shows that patients with CHB are quite sick and are bound to have significant mortality and morbidity.



MORTALITY

Among patients without conduction blocks, 70 (98.59%) survived, whereas only 1 patient (1.41%) did not survive. In contrast, among patients with conduction blocks, 26 (89.66%) survived, and 3 patients (10.34%) did not survive. Overall, 96 patients (96.00%)survived, while 4 patients (4.00%) did not. The p-value of 0.031 indicated a statistically

DOI: 10.69605/ijlbpr_13.10.2024.29

significant association between the presence of conduction blocks and the likelihood of death, with patients experiencing conduction blocks having a higher mortality rate compared to those without conduction blocks. The similar observation was made in study at Mymensingh MCH with higher mortality rate of 20% in patients with conductions defects compared to 3.3% in patients without conduction defects [24]. In the studies by Meine TJ et al.[21],Gang UJ et al.[20] and Shacham Y et al.19 mortality rate was significantly higher in patients with AV blocks than those without.

This could be due to the most severe nature of CAD which is usually seen in Indian patients.In Indians, the CAD is considered to start a decade earlier, and the incidence of multivessel disease is also high. Moreover, the Indian patients are known to have muchsevere disease compared to lesion severity, in the form of significant myocardial damage, lower ejection fractions, higher morbidity and mortality for the same amount of disease. This could very well explain the higher mortality rates in the present study. Furthermore , factors relating to delay in coming to medical attention, as well as a delay in treatments and lack of awareness among patients, could also have resulted inhigher mortality.

CONCLUSION

1. Myocardial Infarction is common in the age group 51-60 years.
2. Diabetes and hypertension are found to be statistically significant comorbidities.
3. 29% of patients with MI developed conduction blocks.The most common conduction block in the present study was first degree AV block 8 cases, followed by 6 cases of CHB, 3 cases Mobitz-type1, 2 cases of Mobitz-type2 and 2:1 AV block, 2 cases of RBBB, 2 casesof LAHB, 2 cases of RBBB+ LAHB and 1 case of LBBB and SA block each.The conduction blocks were significantly more common among patients with inferior wall MI, than the anterior wall MI.Bundle branch blocks were more common in anterior wall MI than inferior wall MI; whereas antrioventricular blocks were more common in inferior wall MI.
4. Common complications were CHF, LVF and cardiogenic shock among both groups. These complications were seen more commonly in patients with blocks.
5. Mortality was higher in patients with blocks, as compared to patients without blocks, various pattern of conduction blocksdeveloped following AMI and they have a varied impact on the outcome, conduction blocks are associated with higher in hospital mortality and morbidity in the form of other cardiovascular events during hospital stay, thus conduction blocks are important predictors of poor outcome in patientswith AMI. All patients with AMI should be watched carefully for early recognition of conduction blocks and appropriate treatment should be started early.

BIBLIOGRAPHY

1. Benjamin EJ, Muntner P, Alonso A, Bittencourt MS, Callaway CW,Carson AP, et al. Heart Disease and Stroke Statistics-2019 Update: AReport From the American Heart Association. Circ. 2019;139(10): e56-e528.
2. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, BuenoH, et al. 2017 ESC Guidelines for the Management of Acute MyocardialInfarction in Patients Presenting with ST-Segment Elevation: The TaskForce for the Management of Acute Myocardial Infarction in PatientsPresenting with ST-Segment Elevation of the European Society of Cardiology (ESC). Eur Heart J. 2018;39(2):119-77.
3. Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effectof Potentially Modifiable Risk Factors Associated with MyocardialInfarction in 52 Countries (the Interheart study): Case-Control Study. Lancet. 2004;364(9438):937-52.
4. Alzahrani T, Pena I, Temesgen N, Glantz SA. Association betweenelectronic cigarette use and myocardial infarction. Am J Prevent Med.2018;55(4):455-61.
5. Attard R, Dingli P, Doggen CJM. The impact of passive and activesmoking on inflammation, lipid profile and the risk of myocardialinfarction. Open Heart. 2017;4:e000620.
6. Huang X, Redfors B, Chen S. Predictors of mortality in patients with non-anterior ST-segment elevation myocardial infarction: analysis from the HORIZONS-AMI trial. Catheter Cardiovasc Interv.2019;94:172–80.
7. Kotecha D, Shah AD. Myocardial Infarction and Conduction Blocks:Review and Guidelines. Eur Heart J. 2017;38(30):2348-59.
8. Morrison TB, Stiell IG. Conduction Abnormalities in Acute MyocardialInfarction: A Review. J Electrocardiol. 2007;40(3):283-95.
9. Zipes DP, Jalife J. Cardiac Electrophysiology: From Cell to Bedside.Elsevier Health Sciences; 2013;pp.36
10. Surawicz B, Knilans TK. Chou's Electrocardiography in Clinical Practice:Adult and Pediatric. Elsevier Health Sciences; 2008.pp.52-8.
11. Podrid PJ. Arrhythmias after acute myocardial infarction. Evaluationand management of rhythm and conduction abnormalities. Postgrad Med1997;102(5):125-39.
12. Kramullah I, Iqbal MA, Hadi A. Conduction disturbances in patients withacute anterior wall infarctions and outcomes. Pak Heart J. 2014;47:156-61.
13. Bauer GE, Julian DG, Valentine PA. Bundle –branch block in acutemyocardial infarction. Br Heart J. 1965;27:724-30.
14. Yahya A. Cardiac Conduction Disorders in Acute Coronary Syndromewith ST Elevation: Study of 51 Cases. Scholars J Med Case Rep.2022;10(2):158-62.
15. Auffret V, Loirat A, Leurent G, Martins RP, Filippi E, Coudert I, Hacot JP,Gilard M, Castellant P, Rialan A, Delaunay R. High-degreeatrioventricular block complicating ST segment elevation myocardial

DOI: 10.69605/ijlbpr_13.10.2024.29

infarction in the contemporary era. Heart. 2016;102(1):40-9.
16. Shirafkan A, Mehrad M, Gholamrezanezhad A, Shirafkan A. Conduction disturbances in acute myocardial infarction: a clinical study and brief review of the literature. Hellenic J Cardiol. 2009;50(3):179-84.
17. Neha K, Magdum S, Basavaraj A, Hange A. Clinical Profile ofBradyarrhythmia in Acute Myocardial Infarction Patients: A ProspectiveObservational Study. Int J Sci Res. 2023;10-2.
18. Swaminathasethupathy R. Study ofconduction blocks in acutemyocardial infarction. Natl J Integr Res Med. 2016;5(6):102-7.
19. Shacham Y, Leshem-Rubinow E, Steinvil A, Keren G, Roth A, Arbel Y.High Degree Atrioventricular Block Complicating Acute MyocardialInfarction Treated with Primary Percutaneous Coronary Intervention: Incidence, Predictors and Outcomes. Israel Med Assoc J. 2015;17(5):298-301.
20. Gang UJ, Hvelplund A, Pedersen S, Iversen A, Jøns C, Abildstrøm SZ etal. High-degree atrioventricular block complicating ST-segment elevationmyocardial infarction in the era of primary percutaneous coronary intervention. Europace. 2012;14(11):1639-45.
21. Meine TJ, Al-Khatib SM, Alexander JH, Granger CB, White HD, Kilaru Ret al. Incidence, predictors, and outcomes of high-degree atrioventricularblock complicating acute myocardial infarction treated with thrombolytictherapy. Am Heart J. 2005;149(4):670-4
22. Arunprasath D, Ramakrishnan C, Dhandapani E, Anand NN. A ClinicalStudy of Conduction Block in Acute Myocardial Infarction. J Res MedDent Sci. 2021;9 (4):406-10
23. Basualdo CA, Haraphongse M, Rossall RE. Intraventricular blocks in acutemyocardial infarction. Chest 1975;67:75-8.
24. Rahman MS, Siddique NA, Hossain MM, Pathan S, Bhuiyan AS, HasanM et al. Relationship of Conduction Defects and In-Hospital Outcomeafter Acute ST Segment Elevation Myocardial Infarction. MymensinghMed J. 2022;31(4):963-9.