Complete Heart Block Complicating Acute Inferior Myocardial Infarction: Risk Factors, Management and Mortality

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Abstract

Complete heart block (CHB) is a well-recognized complication in acute inferior myocardial infarction (MI) patients. A prospective observational study was conducted in the Coronary Care Unit (CCU) under Department of Cardiology, Sher-E-Bangla Medical College Hospital, Barisal, Bangladesh, from November 2014 to May 2015, to identify the risk factors and observe clinical prognosis and outcome in patients of acute inferior myocardial infarction associated with complete heart block. Convenient sampling technique was adopted and a total of 100 patients (77 males and 23 females) were selected based on specific inclusion and exclusion criteria. All the patients participated in the study were evaluated by detailed history, clinical examination and relevant investigations to identify the risk factors. ECG was done on daily basis and continuously observed. Response to treatment, complications and recovery of CHB were observed during hospital stay. The mean age of the patients was 57.16±10.24 years. Smoking (52%), dyslipidemia (36%), hypertension (31%) and diabetes mellitus (26%) were found most common risk factors among those patients. 71% of the patients had isolated inferior MI and was quite responsive to optimum medical therapy (92.95%) and mortality was low (2.81%). However, concomitant right ventricular infarction (18%), posterior infarction (4%) and anterior or lateral infarction/ischemia (7%) had a poorer outcome, i.e. 16.66%, 25%, and 57.14% death respectively. Early presentation (within 24 hours) of CHB had only 4.17% mortality. However, mortality increased in patients as CHB developed after 24 hours (26%). Overall, 10% mortality was observed even with advanced cardiac support. Our data suggest that smoking, dyslipidemia, hypertension and diabetes mellitus are most common risk factors of MI. Complete heart block complicating by acute inferior MI is very much responsive to optimum medical treatment and hardly requires temporary pacemaker. However, concomitant right ventricular infarction, posterior, anterior or lateral infarction/ ischaemia cause poor prognosis and increased mortality.

Key words: Myocardial infarction, complete heart block, risk factor, management, mortality.

Introduction

Acute inferior myocardial infarctions (MI) account for 40-50% of all acute myocardial infarctions.[1] Complete heart block (CHB) is a well-recognized complication of acute myocardial infarction (MI) and tend to develop in about 15-20% acute MI patients.[2] Looking at the pathophysiology, we know that complete heart block occurs most frequently in infarctions due to occlusion of the right coronary artery associated with the electrocardiographic picture of inferior infarction and most resolve after revascularization.[3] Complete heart block may be transient in some patients and appear to be of little consequence. However, in many cases, complete heart block with a slow escape rhythm is a potentially life-threatening event if not detected and treated promptly.[2,4]

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Previous western studies revealed that patient education should focus on diminishing the overall disease burden affecting cardiovascular system, as they are linked to modifiable risk factors.[5] Although not directly causative, underlying cardiac risk factors like dyslipidemia, diabetes mellitus and hypertension are associated with an increased prevalence of electrical conduction abnormalities along with MI5. Most of the patients with complete heart block as complication of acute inferior MI had good prognosis, if they were treated conservatively.[1-3,6] It was also stated that some needed temporary pacemaker.[1-4,6]

Therefore, to determine the modifiable risk factors, select appropriate management, and compare the outcome of hospitalized patients of CHB complicating by acute inferior MI are of current research interest and create an important ground for extensive research to produce evidence based on ethnicity. Surprisingly, to our knowledge, no such study was carried out in recent years despite advancement of cardiac treatment facilities in our country. Therefore, the present study was designed to identify the risk factors and observe clinical prognosis and outcome of the patients with acute inferior myocardial infarction causing complete heart block in a tertiary level facility in Bangladesh.

Materials and Methods

This prospective observational study was conducted in the Coronary Care Unit under Department of Cardiology, Sher-E-Bangla Medical College Hospital, Barisal, Bangladesh, from November 2014 to May 2015. The study population was all the patients of acute inferior myocardial infarction admitted into the hospital during that study period, who had associated complete heart block or developed complete heart block after admission. However, convenient sampling technique was adopted. Finally, a total of 100 patients (77 males and 23 females) were selected based on inclusion and exclusion criteria.

Inclusion criteria:

1. Patients diagnosed as complete heart block in association with acute inferior myocardial infarction (according to the Third Universal Definition of Myocardial Infarction);[7] and

2. Patients of acute inferior myocardial infarction who developed complete heart block after hospital admission.

Exclusion criteria:

1. Patients with first and second degree heart block not progressing to complete heart block;

2. Patients with previous conduction blocks;

3. Patients with cardiomyopathy;

4. Patients with congenital or rheumatic heart disease; and

5. Patients with history of medication which may cause conduction blocks e.g. clonidine, methyldopa, verapamil, digoxin, etc.

Data collection was done after obtaining written informed consent. Initial evaluation of the patients done by history and clinical examination was recorded in the preformed data collection sheet. Demographic profile, pulse, blood pressure, body weight, height, and ECG report at emergency room were recorded. Risk factors like family history, smoking, hypertension, diabetes mellitus, dyslipidemia, obesity and sedentary lifestyle were also noted. BMI was calculated and patients having BMI ≥ 25 Kg/m^2 were considered as obese (according to WHO Expert Consultation).[8] Detailed drug history was taken. Patients who were previously diagnosed as hypertensive and taking antihypertensive or those with raised blood pressure $\geq 140/90$ mm of Hg measured twice were considered as hypertensive (according to the Seventh report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure).[9] Random plasma glucose within 24 hours of MI were measured.

Fasting blood glucose, 2 hours-post-prandial blood glucose and HbA1C were done on the following day. Patients who met American Diabetic Association (ADA) criteria[10] or those who were already on antidiabetic medications were considered as diabetic. Fasting lipid profile was done on the following day. Dyslipidaemia was diagnosed based on National Cholesterol Education Program (NCEP) Expert Panel criteria[11] or who were already taking lipid lowering agent. Baseline investigations like ECG and echocardiography, hematological (e.g. complete blood count), CK (MB), serum troponin-I, serum creatinine, serum electrolytes were also done. ECG was done on daily basis and continuously observed. Recovery of complete heart block (CHB), either transient or persistent, was recorded in pre-designed proforma and response to different treatment modalities and any complications were observed during their hospital stay.

Data were recorded and entered in an excel sheet and analyzed using SPSS (Statistical Package for Social Science) version 16.0. The results were presented in tables and figures. Qualitative or categorical variables were described as frequencies and proportions. The study was approved by the Institutional Ethical Committee of Sher-E-Bangla Medical College, Barisal, Bangladesh.

Results

In the present study, most of the patients were between 50-70 years; mean age was 57.16±10.24 years (Table-I). Smoking (52%), dyslipidemia (36%), hypertension (31%) and diabetes mellitus (26%) were found most common risk factors among those patients. The others were sedentary lifestyle (3%), obesity (2%) and family history (1%) (Fig. 1). 71% of the patients had isolated inferior MI and was quite responsive to optimum medical therapy (92.95%) and mortality was very low (2.81%). However, concomitant right ventricular infarction (18%), posterior infarction (4%) and anterior or lateral

infarction/ischaemia (7%) had a poorer outcome, i.e. 16.66%, 25%, and 57.14% mortality respectively (Fig. 2). Overall, 10% mortality was observed despite advanced cardiac support – due to right ventricular Infarction (3 patients), left ventricular failure (1 patient), extreme bradycardia (1 patient), cardiogenic shock (2 patients), and fatal arrythmia (1 patient) (Table-II). Among 100 patients, 79 patients were managed with optimum medical treatment, while 11 patients received temporary pacemaker by femoral vein approach. Early presentation (within 24 hours) of CHB had only 4.17% mortality. However, mortality increased in patients as CHB developed after 24 hours (26%) (Table-III).

Table-I: Distribution of the patient by age group with sex (n=100)

Age group (in years)	Male Frequency (%)	Female Frequency (%)
31-40	5 (6.49%)	0
41-50	14 (18.18%)	4 (17.39%)
51-60	27 (35.07%)	10 (43.48%)
61-70	21 (27.27%)	8 (34.78%)
71-80	8 (10.39%)	1 (4.35%)
>80	2 (2.60%)	0
Total	77	23
Mean±SD	57.16±10.24 years	
Range	38-84 years	

Fig. 1: Bar diagram showing pattern of risk factors in the study patients (n=100)
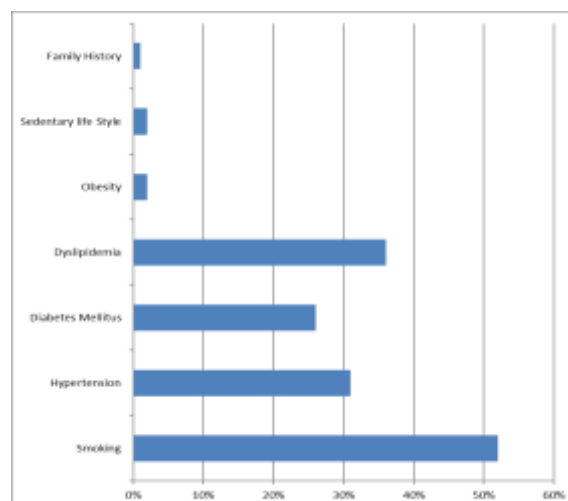
Fig. 2: Bar diagram showing clinical outcome of complete heart block in different patterns of myocardial infarction
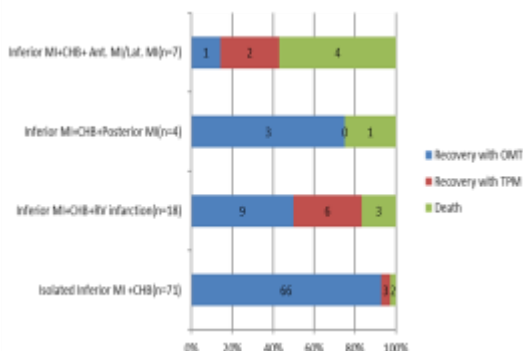

Table-II: Pattern of complications and mortality

Complications	Number of patients	Mortality (%)
RV Infarction	18	3 (16.67%)
LVF	3	1 (33.33%)
Extreme bradycardia	11	1 (9.09%)
Cardiogenic shock	5	2 (40.0%)
Fatal arrythmia	1	1 (100%)

Table-III: Outcome with time of onset of complete heart block (n=100)

Outcome	Patients who had CHB within 24 hours of onset of symptoms n=72		Patients who had CHB after 24 hours n=28
	Diagnosed on admission n=31	Presented after admission n=41	
Recovery with medical management	28 (90%)	36 (87.8%)	15 (53%)
Recovery with temporary pacemaker	2 (6.5%)	3 (7.3%)	6 (21%)
Death	1 (3.5%)	2 (4.87%)	7 (26%)

Discussion

In the present study, most of the patients were between 50-70 years; mean age was 57.16±10.24 years. Similarly, the previous studies done by Abidov *et al*, Newby *et al.* showed increasing age had increasing possibility of complete heart block.[12,13] Although majority of the patients in this study were male (77%), it showed no significant difference in clinical outcome. This is also supported by the study done by Ali, Asghar & Rehman.[14]

Our data suggest that smoking, dyslipidemia, hypertension and diabetes mellitus were the most common risk factors of myocardial infarction. However, Ali, Asghar & Rehman showed in their study that 42.26% were diabetics and hypertensive, 57.14% were smokers; in contrast to our study, family history, obesity and dyslipidemia were present in 19.04%, 42.85% and 27.97% of patients respectively.[14] Our results are also supported by Yusuf *et al.*[5]

Clinical outcome is influenced by the pattern of newer area of infarct that frequently occurred in the patients of acute inferior MI. Concomitant right ventricular (RV) infarction, posterior infarction and anterior or lateral infarction/ischemia had poorer outcomes and increased mortality. The mortality rates found in our study in patients of acute inferior MI with RV infarction, MI with concomitant posterior infarction and MI with anterior or lateral infarction/ischemia are similar to the findings of Ali, Asghar & Rehman, Samadhikhah *et al.,* and Majumder, Malik & Zafar.[14-16]

Overall, our study showed 10% mortality. This is quite similar to the short-term mortality as reported in other studies – Ali, Asghar & Rehman (9.52%), Christiansen, Haghfelt & Amtorp (19%), and Nicod *et al.* (24%).[14,17,18]

However, Gregory & Grance (33%), Paulk & Hurst (41%) and Kostuk & Beanlands (45%) reported higher mortality, while Gould *et al*[2] (6%) and Bates *et al.* (6.4%) observed a lower incidence in their studies.[19-23] All those studies were done in the era of specialized Coronary Care Unit (CCU).

However, this study had some limitations that it was conducted in a single center and study population was relatively small. Moreover, it was observational non-randomized and might be subjected to selection bias and only major traditional risk factors were seen here, other possible emerging risk factors were not looked for.

Conclusion

In summary, complete heart block complicating acute inferior myocardial infarction is very much responsive to optimum medical treatment and hardly requires temporary pacemaker. An early presentation of complete heart block allows an early intervention, better prognosis and recovery. However, we recommend further studies in the same population with lager samples and longer duration, in multiple sites with randomized sampling and ensuring availability of better emergency treatment facility and high technical back-up.

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