

## INDICATION AND FREQUENCY OF IMPLANTATION OF PERMANENT PACEMAKER IN COMPLETE HEART BLOCK PATIENTS IN A TERTIARY CARE HOSPITAL IN RAWALPINDI

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### ABSTRACT

**Objective:** To find out the indication and frequency of permanent pacemaker implantation in complete heart block patients (CHB).

**Study Design:** Prospective cohort study.

**Place and Duration of Study:** Rawalpindi Institute of Cardiology, Rawalpindi for a period of six months from Mar 2016 to Sep 2016.

**Material and Methods:** Total 153 patients of both genders coming to Rawalpindi Institute of Cardiology with complete heart block were included in the study. The patients fulfilling the inclusion criteria were evaluated for the etiology of complete heart block by history, physical examination, electrocardiography, blood tests, chest x-ray and echocardiography. Later their outcome (pacemaker implantation/medical treatment/death) was determined.

**Results:** Myocardial infarction was found out to be the cause for CHB in 32.1% patients. Out of 153 patients, 12 patients died. In the remaining 141 patients, 77 were implanted with a pacemaker.

**Conclusions:** Myocardial infarction accounted for 32.1% cases of complete heart block and a significant number of patients were implanted with a permanent pacemaker. Hence the trend of pacemaker use is on a rise.

**Keywords:** Complete heart block, Indications, Permanent pacemaker.

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### INTRODUCTION

Death due to heart diseases is the major contributor to mortality globally. More than 17 million deaths occur annually throughout the world due to heart diseases<sup>1</sup>. In coronary heart diseases, myocardial infarction is a major complication<sup>2</sup>. Asian population has a greater susceptibility to myocardial infarction due to accumulation of risk factors that include a higher body mass index (BMI), family history, smoking, hypertension, hyperlipidemia, and diabetes<sup>3</sup>.

Myocardial infarction (MI) is of two types; ST elevation MI and non ST elevation MI. ST Elevation Myocardial Infarction (STEMI) is major health problem in the industrialized countries and its magnitude is on the rise in developing world<sup>4</sup>. Acute ST-elevation myocardial infarction

accounts for nearly 1 million hospital admissions annually<sup>5</sup>.

Ischemic injury can produce conduction block at any level of the atrioventricular and intraventricular conduction system. Complete heart block can occur in patients with either inferior or anterior myocardial infarction, although it is more commonly seen with inferior myocardial infarction, usually developing gradually, often progressing from first or second degree atrioventricular block<sup>6</sup>.

Complete Heart Block (CHB) is a relatively frequent complication in patients hospitalized with acute myocardial infarction (AMI). The incidence of CHB complicating STEMI has increased slightly over the last decade, although the absolute incidence remains quite low<sup>7</sup>. Conduction problem in atrioventricular system of heart can range from delayed and intermittently blocked conduction to completely blocked conduction. These conduction problems are classified as

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first, second and third degree heart block respectively. In third degree heart block, also known as complete heart block conduction between atria and ventricles completely stops resulting in independent contraction of atria and ventricles from each other<sup>8</sup>.

Complete heart block is a serious condition and requires immediate treatment. Study of a population that included patients having known heart disease and normal individuals revealed that complete heart block can be congenital, due to degenerating conduction system, as a

Javaidet *al* at Punjab Institute of Cardiology observed that CHB occurred in 31% of patients requiring temporary pacing in the setting of acute myocardial infarction (AMI) and in-hospital mortality occurred in 8% of patients<sup>11</sup>.

The aim of our study was to find out the etiology and current trend of pacemaker implantation in patients of complete heart block reporting to Rawalpindi Institute of Cardiology.

**MATERIAL AND METHODS**

This was a prospective cohort study

**Table-I: Demographic characteristics of study patients (n=153).**

Demographic characteristics	No. of cases	Percentage
<b>Age (years)</b>		
<40	8	5.22
41 to 50	21	13.72
51 to 60	42	27.45
61 or above	82	53.59
Mean ± SD	63.02 ± 13.64	-
<b>Gender</b>		
Male	93	60.78
Female	60	39.21
<b>Risk Factors</b>		
Diabetes	53	34.60
Hypertension	67	43.80
Smoking	31	20.30
<b>Presenting complaints</b>		
Chest Pain	49	32.00
Dizziness/Vertigo	58	37.90
Loss of consciousness	35	22.90
Other complaints	27	17.60

**Table-II: Etiological factors in study patients (n=153).**

Findings	No. of cases	Percentage
<b>Presence of Etiological Factors</b>		
Anterior wall MI	11	7.20
Inferior wall MI with right ventricle infarction	35	22.90
Inferior wall MI without right ventricle infarction	3	2.0
Drug induced	23	15.0
Metabolic	8	5.20
Other causes (Sinus node dysfunction/degenerative diseases)	81	52.90

complication of acute myocardial infarction or due to metabolic derangements. However, cause remained unknown in a significant number of cases<sup>9</sup>. The overall incidence of CHB is 2 to 13% depending on type of myocardial infarction.<sup>10</sup>

conducted from March 2016 to September 2016 in Rawalpindi Institute of Cardiology, Rawalpindi. The study was started after formal approval from Ethical Review Committee of Rawalpindi Institute of Cardiology. Total 153 cases with AMI

were included in the study through non-probability based consecutive sampling. Sample size was calculated using WHO sample size calculator assuming confidence level of 95%, alpha error of 5%, study power of 80%, anticipated population proportion with AMI of 8% and desired precision of 4%<sup>4</sup>. A proforma was designed to identify and mark risk factors, etiology, presenting complaints, left ventricular dysfunction, hemodynamic stability and outcome of patients having complete heart block. Male and female patients having an age of 20 to 96 years and presenting to emergency with complaints of chest pain, vertigo, dizziness or loss of consciousness and having electro-cardiographic manifestations of complete heart block were included in the study.

A detailed history of patients fulfilling the inclusion criteria was taken to identify the risk factors. Vitals (pulse, blood pressure, temperature and respiratory rate) were recorded to assess the hemodynamic stability of the patient. ECG was performed to find out the site of infarction. Blood complete picture, urea and electrolyte concentration, renal function tests, liver function tests and chest x-ray were carried out for these patients to find out the etiology. Left ventricular dysfunction was analyzed by echocardiography.

Data was analyzed using SPSS version 21. Frequencies of all qualitative variables were analyzed and expressed as percentages. Quantitative variables were expressed as mean  $\pm$  standard deviation. Comparison of outcome in different groups was evaluated using chi-square test. A *p*-value less than 0.05 was considered statistically significant.

## RESULTS

A total of 153 subjects comprising of 93 (60.78%) males and 60 (39.21%) females having a mean age of  $63.02 \pm 13.64$  years were included in the study.

The demographic characteristics of study patients and their etiology is summarized in table-I & II respectively. The first major etiological factor (52.9%) for complete heart block came out to be other causes which include sinus node

dysfunction and degenerative diseases of control system. The second major etiological factor was Myocardial Infarction (32.1%). In myocardial infarction most cases occurred due to inferior wall MI (24.9%) and less occurred due to anterior wall MI (7.2%). Third contributing cause was drug induced and electrolyte imbalance. The drugs causing complete heart block were beta blockers, digoxin and amiodarone respectively.

The outcome of patients suffering from complete heart block is presented in figure. Out of 153 patients, death occurred in 12 patients. In the remaining 141 patients, 77 were implanted

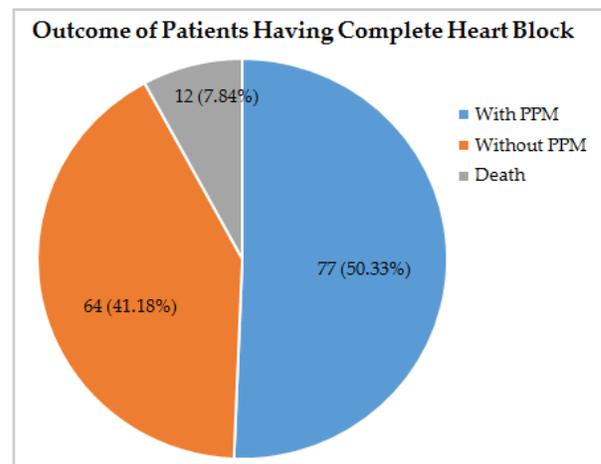


Figure: Outcome of patients having complete heart block (n=153).

with a pacemaker and in 64 patients the problem resolved without intervention. The percentage of patients being implanted with pacemaker having a particular etiological factor is summarized in table-III.

## DISCUSSION

The present study was conducted at Rawalpindi Institute of Cardiology, Rawalpindi to assess the indications of implantation of permanent pacemakers in patients coming to the hospital with complete heart block resulting from different etiologies. The major indication for implantation of pacemaker in the present study came out to be other causes that includes sinus node dysfunction and degenerative diseases of heart. A significant number of CHB patients

having the said etiology were implanted with pacemaker (table-IV).

Permanent pacing is required in patients having symptomatic heart block, but if the heart block occurs due to some reversible condition, e.g. metabolic derangements in the body, it can be treated by other means<sup>9</sup>. Permanent pacemaker (PPM) is implanted in complete heart block patients to reestablish the rate and rhythm of heart, relieve the symptoms of bradycardia and to provide hemodynamic stability. It results

Pacemaker was implanted to treat bradyarrhythmias, tachyarrhythmias, some types of syncope and heart failure in later stages. The main deciding factor for pacemaker implantation was the presenting symptom of bradyarrhythmia or tachyarrhythmia. Symptomatic bradycardia lead to development of syncope, dizziness and confusion due to reduced cerebral blood flow<sup>15</sup>.

Results of national and international studies both show that the use of pacemakers is increasing. A study conducted during 1993 to

**Table-III: Pacemaker implantation in study patients with complete heart block (n=153).**

Etiologies	No. of cases	Percentage	Risk Ratio	
			Value	95% CI
<b>Pacemaker Implantation</b>				
Anterior wall MI (n=11)	3	27.27	1.91	0.71-5.08
Inferior wall MI with right ventricle infarction (n=35)	10	28.57	1.98	1.15-3.43
Inferior wall MI without right ventricle infarction (n=3)	2	66.66	0.75	0.33-1.69
Drug induced (n=23)	9	39.13	1.33	0.78-2.28
Metabolic (n=8)	4	50.0	1.01	0.49-2.05
Other causes (n=81)	52	64.19	0.54	0.37-0.77

**Table-IV: Significance of pacemaker implantation in patients with various etiological factors.**

Etiological Factors	Pacemaker Implantation		p-value
	Not Implanted	Implanted	
Anterior wall MI (n=11)	8	3	0.101
Inferior wall MI with right ventricle infarction (n=35)	25	10	0.003*
Inferior wall MI without right ventricle infarction (n=3)	1	2	0.505
Drug induced (n=23)	14	9	0.174
Metabolic (n=8)	4	4	0.633
Other causes (n=81)	29	52	<0.001

\*p-value less than 0.05 considered significant.

in a better clinical outcome and improved patient health<sup>12</sup>.

After the first device was implanted in 1958 at Karolinska Institute in Solna, the use of cardiac pacemakers is increasing day by day. Literature review reveals that worldwide greater than 3 million people have been implanted with pacemakers and the annual implantation rate is estimated to be 600,000<sup>13</sup>. It is considered a useful method to treat patients having symptomatic cardiovascular disease<sup>14</sup>.

2009 to observe the trend in pacemaker implantation in United Kingdom revealed a 55.6% overall increase in its use<sup>16</sup>.

The results of another international study conducted by Antonelli *et al* also showed that the rate of implantation has increased over a 20 years period with the preferential use of dual chamber pacemakers<sup>17</sup>.

In Pakistan, the trend of permanent pacemaker implantation is also increasing. In a

one year study conducted at Armed Forces Institute of Cardiology, outcome of acute ST elevation MI and subsequent pacemaker implantation was studied<sup>18</sup>. A total of 345 patients having acute ST elevation MI were studied. About 17.6% patients suffered from various conduction defects and one patient was implanted with a pacemaker. Another study conducted at Peshawar in Hayatabad Medical Complex revealed a total of 415 pacemakers implanted over a duration of six years<sup>19</sup>. The pacemakers after being implanted require regular follow up and careful monitoring. The frequency of follow up depends on patient age and comorbid conditions.

**CONCLUSION**

The present study shows that half (50.3%) of patients with complete heart block coming to tertiary care hospital were implanted with permanent pacemaker. The major indication for pacemaker implantation in this study was found out to be other causes (sinus node dysfunction, degenerative diseases of conduction system).

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**CONFLICT OF INTEREST**

This study has no conflict of interest to declare by any author.

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