ACUTE MYOCARDIAL INFARCTION;
Frequency of complete heart block in patients at a tertiary care hospital

Dr. Atif Sitwat Hayat, Dr. Muhammad Adnan Bawany, Dr. Jawad Ahmed Qadri, Dr. Kiran Khalil.

ABSTRACT… Background: Ischemic heart disease is the most common cause for complete heart block (CHB) and sudden death. Heart blocks may occur as complications of acute myocardial infarction (AMI) and are associated with increased mortality. The aim of this study is to determine the frequency of complete heart block (CHB) in acute myocardial infarction at a tertiary care hospital. **Place and duration:** This study was conducted in Cardiology Department of Liaquat University of Medical and Health Sciences from 1st August 2009 to 31st January 2010. **Study Design:** Cross sectional and descriptive study. **Materials and Methods:** ST segment elevation equal to or more than 1mm (0.1mv) in two of these leads II, III and aVF. Rise in serum creatinine kinase level (CPK Level) more than twice the normal value along with CK-MB fraction more than 6% of CPK value. Patients with history of chest pain, shortness of breath, nausea, vomiting and unconsciousness were enrolled in the study. The cardiac enzymes tropinin T was also performed at bed side by venous blood sample. **Results:** Total of 87 patients were included, prevalence of heart blocks was 27.58%. Anterior wall MI was in 50(57.5%) patients. Of these, 13(54.2%) had complete heart block. Inferior wall MI was in 37(42.5%) cases, of these, 11(45.8%) were found with complete heart block. There was no significant difference between anterior wall MI and inferior wall MI with complete heart block (P value > 0.05). Mortality was 2.3% with anterior wall MI. **Conclusions:** Development of complete heart blocks has important prognostic significance. Complete heart block was frequent complication of myocardial infarction.

Key words: Acute myocardial infarction, complete heart block, Inferior wall MI, anterior wall MI.

INTRODUCTION
Complete heart block (CHB) is major clinical complication in patients hospitalized with acute myocardial infarction (AMI), prior studies have suggested that approximately 4% to 7% of patients hospitalized with AMI will develop CHB[1].

In pre-thrombolytic era, high (third degree) AV block was seen in approximately 5-7% of patients presenting with acute MI[2]. In setting of inferior MI, this was even as high as 28%[3].

Although, after the advent of thrombolytic therapy has substantially decreased the mortality associated with acute MI, the incidence of AV block, particularly in myocardial infarction[4], associated with high mortality in hospital; however, its effect on long-term mortality is uncertain[5]. The occurrence of high degree AV block is usually explained by the fact that the blood supply to the AV node depends in 90% of patients on the Right Coronary Artery (RCA)[6-8].

CHB may be inherited acquired, most important causes include myocardial infarction, drug intoxication, surgery, rheumatic disease, infiltrative heart disease, myocarditis, and hypertensive heart disease. Acquired CHB is usually accompanied by signs and symptoms of reduced cardiac output (CO). The prognosis of CHB has improved greatly after the invention of the pacemaker. Before using pacemaker, acquired CHB was associated with high mortality with sudden death, progressive heart failure[9]; complete atrio-ventricular block is relatively frequent complication of myocardial infarction with early diagnosis and thrombolytic therapy, hospital mortality reduced. Complete AV block and syncope sometimes are the presenting signs of acute myocardial infarction. Among patients of acute inferior myocardial infarction, frequency of artio-ventricular block is high particularly complete heart block that complicates in hospital course[10].

The incidence of CHB complicating AMI has declined

appreciably over time, with the greatest decline in these incidence rates occurring during the most recent years (2.0% of patients hospitalized with AMI in 2005 vs. 5.1% in 1975)[11]. Although Rathor and Gersh showed that the incidence of heart blocks is higher among those patients who had a history of thrombolytic therapy[12].

Contemporary AV block rarely complicates myocardial infraction with early revascularization strategy, the incidence of AV block decreased from 5.3 to 3.7%. Occlusion of each of the coronary arteries can result in development of conduction disease despite redundant vascular supply to the AV node from all coronary arteries. Most common the occlusion of the right coronary artery (RCA) is accompanied by AV block. In particular the proximal RCA occlusion has high incidence of AV bock (24%) since not only the AV nodal artery is involved but also right superior descending artery, which originates from the very proximal part of the RCA[13].

In most cases, AV block resolves promptly after revascularization but sometimes the course is prolonged. Overall the prognosis is favorable. AV block in a setting of occlusion of the left anterior descending artery (particularly proximal to the first septal perforator) has more ominous prognosis and usually requires pacemaker implantation. Second degree AV block associated with bundle branch block and in particularly with alternating bundle branch block is an indication for permanent pacing[14]. Patients with complete heart block are frequently hemodynamically unstable, and as a result, they may experience syncope, hypotension, cardiovascular collapse, or death. Other patients can be relatively asymptomatic and have minimal symptoms other than dizziness, weakness, or malaise.

This study is important in our setup as majority of patients die from heart blocks associated with acute MI and hence to decrease mortality. Therefore, objective of our study is to determine frequency of complete heart block in patients of acute myocardial infarction at a tertiary care hospital.

MATERIALS AND METHODS
This Cross sectional and descriptive study was conducted in Cardiology Department of Liaquat University of Medical and Health Sciences Jamshoro/ Hyderabad for six months from 1st August 2009 to 31st January 2010.

Total 87 cases of myocardial Infarction were included; adult patients age ranged 25 to 65 years of either sex presenting with severe chest pain, shortness of breath and unconscious state and fulfill the following criteria:
1.   ST segment elevation equal to or more than 1mm(0.1mv) in two of these leads II, III and aVF.
2.   Rise in serum creatinine kinase level (CPK Level) more than twice the normal value along with CK-MB fraction more than 6% of CPK value.
3.   Inferior wall myocardial infarction with concomitant right ventricular infarction i.e. ST segment elevation equal or more than 1 mm in one or more right precordial lead V4R to V6R.

EXCLUSION CRITERIA
1.   The patients with history of artificial pacemaker implantation.
2.   The patients had previous history of myocardial infarction / old myocardial infarction and were already on maintenance therapy.

DATA COLLECTION PROCEDURE
The study was conducted on the basis inclusion and exclusion criteria. A written consent was taken from all patients who came in the coronary care unit (CCU) or cardiac ward with history of chest pain, shortness of breath, nausea, vomiting and unconsciousness were evaluated and enrolled in the study. All the patients

were examined for acute myocardial infarction by performing electrocardiogram (ECG). The cardiac enzymes tropinin T was also performed at bed side by venous blood sample.

Temporary pacemaker was also considered if any type of bardycardia (sinus or atrio-ventricular block) causing symptoms and signs of low perfusion. In these patients of acute myocardial infarction, the in-hospital complications were divided into major and minor. Among the major asystole, angina, reinfarction, altered consciousness, ventricular tachycardia, death, congestive cardiac failure (CCF) and sinus bardycardia. Among the patients having atrioventricular blocks, the degree of block, duration and in case of complete heart block the stability of escape rhythm in view of QRS width, heart rate and associated other conduction defects (inraventicular) were also recorded. The diagnosis of MI and detection of complete heart block were made according to parameters. All the data were recorded through a structured proforma.

ETHICAL CONSIDERATIONS
The study was approved by local ethics committee of the institution. Written informed consent was obtained from all participants.

STATISTICAL ANALYSIS
The data were evaluated in statistical program SPSS version 16.0. Qualitative data (frequency and percentage) such as complete heart block (with and without), gender, age (in groups), myocardial infarction (inferior and anterior), complications and outcome were presented as n (%) and chi-square test was applied to compare the proportions among the groups with and without complete heart block. The numerical parameters such as age (in years), hospital stay(in days), heart rate etc. were expressed as mean + standard deviation and student t test (2 tailed) was applied to compare the means among the group (with and without complete heart block). All the data were

calculated on 95% confidence interval. A p value < 0.05 was considered as statistically significant level for all the comparisons.

RESULTS
Eighty seven patients of myocardial infarction were analyzed in this study based on inclusion criteria. Of these, 54(62.1%) were male and 33 (37.9%) female. The mean age + SD of the patients was 52.03 ± 8.58 years (range 25-66 years). The overall prevalence of heart blocks was 27.58 (24 patients).

Out of these 87 cases of MI, 54(62.1%) were males; out of them 14(58.3%) males had complete heart block. There were 33(37.9%) females; out of them 10(41.7%) were presented with complete heart block. No significant difference was noted regarding complete heart block in gender (p value 0.80).

Out of 87 subjects, 27(31.0%) were seen in the age group of 25 to 45 years and 60(69.0%) cases were found 46 to 66 years of age group. Majority of the patients with complete heart block was seen in older patients.

Out of 27(31.0%) patients who were found in the age group of 25 to 45 years, 7(29.2%) patients with mean age $\pm$ SD, 41.2 ± 7.31 developed complete heart block as compared those 60(60.9%) patients of > 45 years, 17 (70.8%) with mean age $\pm$ SD, 55.5 ± 6.48 developed complete heart block, there was statistically significant difference of age group with and without complete heart block (p value 0.0001). Most of the males were older and all the females were found in the age group of >45 years. There was insignificant difference among the gender and age (p value 0.81).

Out of 62(71.3%) cases of hospital stay <7 days, 19(79.2%) patients with complete heart block and 43(68.3%) without complete heart block whereas out of 25(28.7%) cases of hospital stay >7 days,

5(20.8%) had complete heart block and 20(31.7%) patients did not develop the complete heart block.

All the patients had myocardial Infarction in this study, out of 87 cases of myocardial infarction, anterior wall MI was present in 50(57.5%) patients. Of these, 13(54.2%) cases were found with complete heart block. Inferior wall MI was present in 37(42.5%) cases, amongst which, 11(45.8%) cases were found with complete heart block. There was no any significant difference or statistical correlation between anterior wall MI and inferior wall MI with complete heart block.

In-hospital complications 87 patients of acute myocardial infarction between complete and without complete heart block are presented. These complications were recorded during their whole stay in CCU. Overall mortality during hospital stay in 87 patients of acute myocardial infarction with complete heart block was determined in 2 (2.3%) patients with anterior wall MI. Three (3.4%) patients with inferior wall MI without complete heart block developed ventricular tachycardia, 2(3.2%) cases of inferior wall MI had re-infarction and 1(1.1%) patient had post MI angina. One (1.1%) patient who had complete heart

block with anterior wall MI developed pericarditis and Stokes – Adams attacks respectively.

Out of 87 cases of myocardial infarction, only 3(12.5%) patients with inferior wall MI were reverted to normal rhythm.

Parameters	With Complete Heart Block n=24	Without Complete Heart Block n=63	p-value
Age (in years)	51.4 ± 9.34	52.2 ± 8.35	NS
Gender: Male Female	14 (58.3%) 10 (41.7%)	40 (63.5%) 23 (36.5%)	NS
Age Groups: 25 to 45 46 to 66	7 (29.2%) 17 (70.8%)	20 (31.7%) 43 (68.3.0%)	NS
Hospital stay (in days)	5.5 ± 1.86	6.4 ± 2.17	NS
Hospital stay (in groups) <7 days >7 days	19 (79.2%) 5 (20.8%)	43 (68.3%) 20 (31.7%)	NS
Heart Rate (beats/min.)	36.2 ± 3.42	89.1 ± 9.47	<0.001*

Table-I. Demographic characteristics (n = 87)
Results are expressed as Mean + Standard Deviation
NS = not significant
p value is statistically highly significant

Age groups	n (%)	With Complete Heart Block n = 24	p value	Without complete Heart Block n = 63	n (%)	p value
25 to 45 years (Mean ± SD)	7 (29.2%)	41.2 ± 7.31	< 0.0001**	42.5 ± 3.3	20(31.7%)	< 0.0001**
> 45 years (Mean ± SD)	17 (70.8%)	55.5 ± 6.48		56.7 ± 5.6	43(68.3%)	

Table-II. Mean comparison of age in years with and without complete heart block (n = 87)
*** p value is statistically highly significant*

Myocardial infaction	With Complete Heart Block n = 24	Without Complete Heart Block n = 63	Total	p value
Anterior Wall MI	13 (54.2%)	37 (58.7%)	50(57.5%)	0.80*
Inferior Wall MI	11 (45.8%)	26 (41.3%)	37(42.5%)	0.79*

Table-III. Myocardial infarction with and without complete heart block (n = 87)
p value is statistically not significant

Complications	With Complete Heart Block n = 24	Without Complete Heart Block n = 63	Total
Intermittent asystole	1 (4.2%)	0	1(1.1%)
Re-infarction	0	2 (3.2%)	2(2.3%)
Ventricular tachycardia	0	3 (4.8%)	3(3.4%)
Post MI Angina	0	1 (1.6%)	1(1.1%)
Death	2 (8.3%)	0	2(2.3%)
Pericarditis	1 (4.2%)	0	1(1.1%)
Stokes-Adems attacks	1 (4.2%)	0	1(1.1%)

Table-IV. Complications of myocardial infarction with and without complete heart block (n = 87)

Complications	Inferior Wall MI		Total
	With inferior n = 37	Without inferior n = 50	
Intermittent asystole	0	1 (2.0%)	1 (1.1%)
Re-infarction	2 (5.4%)	0	2 (2.3%)
Ventricular tachycardia	3 (8.1%)	0	3 (3.4%)
Post MI Angina	1 (2.7%)	0	1 (1.1%)
Death	0	2 (4.0%)	2 (2.3%)
Pericarditis	0	1 (2.0%)	1 (1.1%)
No complication	31 (83.8%)	45 (90.0%)	76(87.4%)
Stokes - Adams attacks	0	1 (2.0%)	1 (1.1%)

Table-V. Complications with inferior wall MI (n = 87)

Complications	Inferior Wall MI		Total
	With inferior n = 50	Without inferior n = 37	
Intermittent asystole	1 (2.0%)	0	1 (1.1%)
Re-infarction	0	2 (5.4%)	2 (2.3%)
Ventricular tachycardia	0	3 (8.1%)	3 (3.4%)
Post MI Angina	0	1 (2.7%)	1 (1.1%)
Death	2 (4.0%)	0	2 (2.3%)
Pericarditis	1 (2.0%)	0	1 (1.1%)
No complication	45 (90.0%)	31 (83.8%)	76(87.4%)
Stokes - Adams attacks	1 (2.0%)	0	1 (1.1%)

Table-VI. Complications with anterior wall MI (n = 87)

Outcome	Inferior Wall MI		Total
	Inferior n = 11	Anterior n = 13	
Reversion to Normal rhythm	3 (27.3%)	0	3(12.5%)
No reversion to normal rhythm	8 (72.7%)	13 (100.0%)	21(87.5%)

Table-VII. Comparison of outcome between inferior and anterior wall mi in complete heart block (n = 24)

DISCUSSION

Heart block (atrio-ventricular block) is more common with inferior than anterior wall infarction[15]. The development of heart block is associated with more post-infarction hypokinesia of cardiac walls, a lower ejection fraction, and greater in-hospital mortality. These detectable abnormalities have important prognostic significance[16].

The present study reveals that complete heart block may be due not only to inferior wall myocardial infarction but also to infarcts of the anteroseptal wall. It seems clear that majority of patients with inferior wall myocardial infarction, in whom the right coronary artery had probably been obstructed, suffered from a block which was situated above the bifurcation. The right coronary artery gives off the posterior perforating arteries that supply the posterior third of the interventricular septum.

Patients of this study were divided into two groups depending on absence and presence of complete heart block.

Our study shows, overall prevalence with AMI who developed complete heart block was 27.58% (24 patients) out of 87 subjects. A study of Nguyen et al.[17] found that overall incidence of patients with AMI who developed complete heart block is 4.1% whereas Abdul Majeed Pirzada et al.[18] noted that prevalence of AMI with complete heart block was 4.0% out of 220 cases which is similar to the study of Nguyen et al. but found not similar to this study.

Although in this study there was a highly significant difference between the patient's age and incidence of complete heart block (p value < 0.0001) Table No. 3.

This study revealed 2.3% mortality rate out of 87 patients while it was noted by Ben-Ameur Y et al.[19] and Meine TJ[20], the mortality rate in patients with inferior MI and high degree AV block varies from 12-23%. They also reported that these patients had high mortality only in the presence of heart complete heart block. Similarly, in the study of Nguyen et al.[17] also found that patients with AMI who developed complete heart block had greater in hospital mortality 43.2%. In these studies, the mortality rate is found different as compare to this study due to the relatively larger infarct area. Moreover, it should be noted that the in-hospital mortality rate in our infarcted population was considerably lower than that observed in developed countries[20-22].

The frequency of inferior wall MI in this study was 42.52%. Many studies have shown that patients with inferior MI associated with complete heart block have larger infarctions[23-24-26].

In this study, we found that patients with inferior and anterior myocardial infarction who developed complications with complete heart block such as ventricular tachycardia 3.4%, re-infarction 2.3%, intermittent asystole 1.1%, post MI angina, death, pericarditis and Stokes - Adams attacks were seen in 1.1% respectively out of 87 cases. In the study of Khalid Amin et al.[15], patients developed complications i.e. death was 9%, post MI angina was in 27%, re-infarction was in 10%, intermittent asystole was 5% and ventricular tachycardia was 4% out of 130 patients whereas Stokes - Adams attacks were not seen in his study. The prevalence of complications was different in the study of Khalid Amin et al.[15] due to large number of patients.

CONCLUSIONS
It seems that morbidity, as evaluated by the presence and severity of a Stokes-Adams attack, and mortality are much lower in patients with inferior wall myocardial infarction with block above the bifurcation. The use of temporary transvenous pacemakers may have been somewhat excessive in patients with inferior wall myocardial infarction.They are definitely indicated in those patients with antero-septal infarctions and Stokes-Adams attacks.

Among patients with inferior wall myocardial infarction, only for those with block above and below the bifurcation and for those with Stokes-Adams attacks may pacemaker be definitely indicated.

It is also our impression that in a patient with an inferior wall myocardial infarction and block, with a slow ventricular rate, the cardiac output may be improved by ventricular pacing at a faster rate.

This would in all probability be advisable when the block persists for several days. Most patients with inferior wall myocardial infarction and block above the bifurcation may recover with the use of isoproterenol. However, a larger experience is necessary before a final opinion can be given.
Copyright© 12 Jan, 2013.

REFERENCES
1. Spencer FA, Jabbour S, Lessard D, et al. **Two dedicate long trends (1975–1997) in the incidence, hospitalization, and long term death rates associated with complete heart block complicating acute myocardial infarction: A community wide perspective.** Am Heart J 2003;145:500–507.

2. Rathore SS, Gersh BJ, Berger PB, Weinfut KP, Octgen WJ, Schulman KA, et al. **Acute myocardial infarction complicated by heart block in the elderly: prevalence and outcomes.** Am Heart J 2001; 141:47-54.

3. Berger PB, Ryan TJ. **Inferior myocardial infarction; high-risk sub-groups.** Circulation 1990; 81:401-11.

4. Ali M, Rana SI, Shafi S, Nazeer M. **In-hospital outcome of acute inferior wall myocardial infarction with or without right ventricular infarction.** Ann K E Med Coll 2004; 10:420-2.

5. Burns RJ, Gibbons RJ, Yi Q, Roberts RS, Miller TD, Schaer GL, et al. **The relationship of left ventricular ejection fraction, endsystolic volume index and infarct size to 6 months mortality after hospital discharge following myocardial infarction treated by thrombolysis.** J Am Coll Cardiol 2002; 39:30-6.

6. Goldstein JA, Lee DT, Pica MC, Dixon SR, O' Neill WW. **Patterns of coronary compromise leading to brady arrhythmias and hypotension in inferior myocardial infarction.** Coron Artery Dis 2005; 16:265-74.

7. Amin K, Javed M, Mehmood A, Zakaria M, Hussain I, Farida M. **Acute inferior wall myocardial infarction: frequency of AV blocks.** Professional Med J 2004; 11:31-7.

8. Braat SH, Zwaan C, Brugada P, Coenegracht JM, Wellens HJ. **Right ventricular involvement with acute inferior wall myocardial infarction identifies high-risk of developing atrioventricular nodal conduction disturbances.** Am Heart J 1984; 107:1183-7.

Gizurarson S

9. Lorentzon M, Råmunddal T, Waagstein F, Bergfeldt L, Omerovic E. **Effects of complete heart block on myocardial function, morphology, and energy metabolism in the rat.** Europace. 2007 Jun;9(6):411-6.

10. Khalid Amin, Masood Javed, Arif Mehmood, Muhammad Zakria, Israt Hussain, Farida Manzoor. **Acute inferior wall Myocardial Infarction; frequency of AV blocks.** Professional Med J Jan - Mar 2004;11(1): 31-7.

11. Nguyen HL, Lessard D, Spencer FA, et al. **Thirty-year trends (1975-2005) in the magnitude and hospital death rates associated with complete heart block in patients with acute myocardial infarction: a population-based perspective.** Am Heart J. 2008; 156: 227-233.

12. Rathore SS, Gersh BJ, Berger PB, et al. **Acute myocardial infarction complicated by heart block in the elderly: prevalence and outcomes.** Am Heart J. 2001; 141: 47-54.

13. Abuin G; Nieponice A; Barceló A; Rojas-Granados A; Leu PH; Arteaga-Martínez M. **Anatomical reasons for the discrepancies in atrioventricular block after inferior myocardial infarction with and without right ventricular involvement.** Tex Heart Inst J. 2009; 36(1): 8-11.

14. Nguyen HL; Lessard D; Spencer FA; Yarzebski J; Zevallos JC; Gore JM et al. **Thirty-year trends (1975-2005) in the magnitude and hospital death rates associated with complete heart block in patients with acute myocardial infarction: a population-based perspective.** Am Heart J. 2008; 156(2):227-33.

15. Khalid Amin, Masood Javed, Arif Mehmood, Muhammad Zakria, Israt Hussain, Farida Manzoor. **Acute inferior wall Myocardial Infarction; frequency of AV blocks.** Professional Med J Jan - Mar 2004;11(1): 31-7.

16. Nguyen HL, Lessard D, Spencer FA, et al. **Thirty-year trends (1975-2005) in the magnitude and hospital death rates associated with complete heart block in patients with acute myocardial infarction: a population-based perspective.** Am Heart J. 2008;

156: 227-233.

17. Ahmed Ali Shirafkani, Mitra Mehrad2, Ali Gholamrezanzhad3, 4,Ali Shifrafkan2.**Conduction Disturbances in Acute Myocardial Infarction: A Clinical Study and Brief Review of the Literature.** Hellenic J Cardiol 2009; 50: 179-184.

18. Abdul Mueed Pirzada1, Khan Shah Zaman1, Khalid Mahmood2, Tahir Sagheer1, Saeed A. Mahar3 and Mehmood Hassan Jafri1. **High Degree Atrioventricular Block in Patients with Acute Inferior Myocardial Infarction with and without Right Ventricular Involvement.** Journal of the College of Physicians and Surgeons Pakistan 2009, Vol. 19 (5):269-274.

19. Ben-Ameur Y, Mghaieth F, Ouchallal K, Hmem M, Terras M, Longo S, et al. **Prognostic significance of second and third degree atrioventricular block in acute inferior wall myocardial infarction.** Ann Cardiol Angeiol 2003; 52:30-3.

20. Meine TJ, Al-Khatib SM, Alexander JH, Granger CB, White HD, Kilaru R, et al. **Incidence, predictors and outcomes of high degree atrioventricular block complicating acute myocardial infarction treated with thrombolytic therapy.** Am Heart J 2005; 149: 670-4.

21. Theres H, Maier B, Matteucci Gothe R, et al; Berliner Herzinfarktregister e.V. **Influence of gender on treatment and shortterm mortality of patients with acute myocardial infarction in Berlin.** Z Kardiol. 2004; 93: 954-963.

22. Hanratty B, Lawlor DA, Robinson MB, Sapsford RJ, Greenwood D, Hall A. **Sex differences in risk factors, treatment and mortality after acute myocardial infarction: an observational study.** J Epidemiol Community Health. 2000; 54: 912-916.

23. Burns RJ, Gibbons RJ, Yi Q, Roberts RS, Miller TD, Schaer GL, et al. **The relationship of left ventricular ejection fraction, endsystolic volume index and infarct size to 6 months mortality after hospital discharge following myocardial infarction treated by thrombolysis.** J Am Coll Cardiol 2002;39:30-6.

24. Vargas-Barron J, Lopez-Meneses M, Romero-Cardenas A, Espino La-Zavaleta N, Roldan FJ, Keirns C, et al. **The impact of right atrial ischemia on inferior myocardial infarction with extension to right ventricle: transesophageal echocardiographic examination.** Clin Cardiol 2002; 25:181-6.

25. Al-Ali HMS, Durgham AK, Al-Khazalel N, Rashdan H. **Creatine kinase, creatine kinase B - sub-unit and ECG study in acute myocardial infarction.** J Coll Physicians Surg Pak 2001; 11:684-8.

26. Haneef N, Shah SA, Khan RA. **Comparison of gated blood pool ventriculography with echocardiography and contrast ventriculography for left ventricular ejection fraction determination in postmyocardial infarction patients.** Pak J Cardiol 2003; 14:03-11.

AUTHOR(S):

1. **DR. ATIF SITWAT HAYAT**
   MBBS, MD (Medicine)
   Assistant Professor Medicine
   Isra University Hospital, Hyderabad Sindh Pakistan.
2. **DR. MUHAMMAD ADNAN BAWANY**
   MBBS, FCPS (Medicine)
   Senior Registrar
   Israr University Hospital, Hyderabad Sindh Pakistan.
3. **DR. JAWAD AHMED QADRI**
   MBBS, FCPS-I (Cardiology)
   Trainee Registrar, Department of Cardiology
   Liaquat University of Medical & Health Sciences Jamshoro, Hyderabad.

4. *Dr. Kiran Khalil*
   MBBS (Student)
   Isra University Hospital, Hyderabad Sindh Pakistan.

Correspondence Address:
Dr. Atif Sitwat Hayat
Assistant Professor Medicine
Isra University Hala Road Hyderabad.
ashayat@hotmail.com

PREVIOUS RELATED STUDIES

Abdul Rehman Abid, Liaqat Ali, Tahir Mohyuddin, Shahid Naveed, Siraj Munir Ahmed, Muhammad Azhar. ACUTE MYOCARDIAL INFARCTION; EVIDENCE FOR A SEX-AGE INTERACTION (Original) Prof Med Jour 13(2) 178-185 Apr, May, Jun, 2006.

Aftab Ahmad, Zafar Hussain Tanvir, Zafar Hussain. ACUTE MYOCARDIAL INFARCTION; SERUM MAGNESIUM AND ELECTROLYTE LEVELS AT PRESENTATION IN EMERGENCY DEPARTMENT (Original) Prof Med Jour 17(2) 246-251 Apr, May, Jun 2010.

Hafiz Mughees Ather. LEFT VENTRICULAR EJECTION FRACTION AFTER ACUTE MYOCARDIAL INFRACTION (Original) Prof Med Jour 15(2) 234-239 Apr, May, Jun 2008.

Ishtiaq Ahmed Malik, Khalid Mahmood, M Khalid Raja. ACUTE MYOCARDIAL INFARCTION (Original) Prof Med Jour 12(4) 457-465 Oct, Nov, Dec 2005.

Shahid Hafeez, Asim Javed, Azhar Mahmood Kayani. ACUTE MYOCARDIAL INFARCTION; SIGNIFICANCE OF 1ST SET OF CK-MB IN DIAGNOSIS(Original) Prof Med Jour 16(2) 198-201 Apr, May, Jun, 2009.

Happiness does not lie in happiness, but in the achievement of it.

Fyodor Dostoevsky