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RESEARCH ARTICLE

AN OBSERVATIONAL STUDY ON DIASTOLIC FUNCTION IN POST MYOCARDIAL INFARCTION PATIENTS IN A TERTIARY CARE CENTRE IN KANCHEEPURAM DISTRICT

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Abstract

Background: Diastolic dysfunction may be the earliest marker which leads to progressive cardiac failure. Thus the importance of detecting diastolic dysfunction using tissue doppler echocardiography helps in preventing the progression of patients to symptomatic congestive cardiac failure

Objectives:

1. To find the prevalence of diastolic dysfunction in post myocardial infarction patients
2. To study the association between left ventricular diastolic dysfunction and variables such as smoking, Diabetes, Hypertension, Killip class,Type of Myocardial Infarction

Methodology:

Study design: Cross sectional study

Study population : Post Myocardial infarction patients between 30 to 60 years of age

Study period :18 months

Sample size :144

Sampling technique : Convenient sampling

Results: Prevalence of left ventricular diastolic dysfunction is 56%.There is statistically significant association between risk factors like smoking ,hypertension ,diabetes and occurrence of left ventricular diastolic dysfunction($P<0.05$).There is no association between type of Myocardial infarction and left ventricular diastolic dysfunction .

Conclusion: Worsening diastolic function can be detected even in apparently healthy persons. Although confirmation in other studies would be helpful, our data suggest that persistence or progression of diastolic dysfunction is a risk factor for heart failure in post myocardial infarction patients.

Introduction:-

When the myocardium does not receive enough blood and oxygen, coronary artery disease develops. It is caused by a mismatch between oxygen demand and supply owing to coronary artery blockage. The most prevalent cause is plaque formation in the lumen of coronary arteries, which restricts blood flow. It is one among the leading causes of death worldwide.

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Deaths from coronary artery disease peaked in the mid-1960s and then began to drop, while it remains the leading cause of death worldwide.Heart disease and stroke are universally recognised as the main causes of mortality and disability in both developed and developing nations.[1,2]

We are in the middle of a worldwide cardiovascular disease crisis. Cardiovascular disease accounts for around 30% of all fatalities globally each year. Developing nations account for about 80% of these deaths. In nearly every part of the world, cardiovascular disease is the leading cause of death. [3,4]

Diastolic dysfunction may be the earliest marker which leads to the progressive cardiac failure. Thus the importance of detecting diastolic dysfunction using tissue doppler echocardiography helps in preventing the progression of patients to symptomatic congestive cardiac failure. [5]

Left ventricular diastolic dysfunction is characterised by impairment in early diastolic filling , prolongation of isovolumetric relaxation and increased atrial filling . The prevalence of diastolic dysfunction is due to myocardial fibrosis, the most likely reason for this is due to the accumulation of advanced glycosylation products in the myocardium. [6]

The term “diabetic cardiomyopathy” (DC) was introduced to refer to a cardiac entity characterized by the presence of abnormal myocardial performance or structure in the absence of epicardial coronary artery disease, hypertension, and significant valvular disease. Clinically, DC is characterized by cardiac hypertrophy and diastolic dysfunction, which may result in heart failure with preserved ejection fraction (HFpEF)

The first and most important study that reported an increased risk of heart failure in patients with T2DM was the U.K. Prospective Diabetes Study (UKPDS) with 4,585 patients. This study reported that increased HbA1c was associated with a higher risk of heart failure incidence for a period of 10 years.The association between T2DM and heart failure seems to be independent of traditional risk factors. Non-insulin dependent DM has independent adverse cardiac effects, including increased LV mass and wall thicknesses, reduced LV systolic chamber and myocardial function and increased arterial stiffness.

Diastolic dysfunction-abnormal patterns
A. Abnormal Relaxation pattern
B. Pseudonormalisation
C. Restrictive pattern
1. Reversible
2. Irreversible

Evaluation of diastolic dysfunction
Modalities used to evaluate diastolic function
1. Echo-Doppler
2. Radionuclide Studies
3. Haemodynamic Studies
4. Tissue Doppler Studies

2D Echocardiography

Heart echocardiography is a non-invasive, safe examination that gives vital cardiac function data to the clinical team. This functional data is required for the management of patients with a variety of ailments and is utilised to diagnose a variety of illnesses.

The M-mode and Doppler echocardiograms are guided by 2D echocardiographic imaging, which offers tomographic images of various planes of the heart structures. Instead of having a fixed line of sight, the scan line in 2D echocardiographic imaging is swept back and forth over an arc. The echocardiographic machine generates a 2D tomographic image for display after extensive modification of the data collected by the transducer from several scan lines.

HEART FAILURE is a progressive condition that increases in incidence with advancing age. There is an emerging emphasis on understanding the progression from heart failure risk factors to asymptomatic ventricular dysfunction and eventually to symptomatic heart failure and death. Therefore, it is important to have population-based

information on changes in cardiac function over time. Heart failure may develop with reduced or preserved left ventricular ejection fraction (LVEF), each form accounting for approximately half of the cases.[5,6]

Echocardiographic classification of diastolic function in cross sectional community studies has shown diastolic dysfunction to be highly prevalent and associated with heart failure.[7] However, little is known about time-dependent changes in diastolic function or their relationship to clinical heart failure.Acute myocardial infarction is one of the leading causes of death among men and women.The late mortality associated with myocardial infarction is typically due to left ventricular dysfunction and its complications.The severity of diastolic dysfunction is related to the development of heart failure. Early identification of distolic dysfunction and its treatment can prevent/delay the onset of congestive heart failure in post myocardial infarction patients.Hence the present study is conducted with following objectives.

Objectives:-

1. To find the prevalence of diastolic dysfunction in post myocardial infarction patients.
2. To study the association between left ventricular diastolic dysfunction and variables such as Smoking, Diabetes, Hypertension, Killip class,Type of Myocardial Infarction.

Methodology:-

Study design:
Cross sectional study

Study setting :
Cardiology and General medicine department of Karpaga Vinayaga Medical College and Research Centre, Kancheepuram district, Tamilnadu.

Study population :
Post Myocardial infarction patients between 30 to 60 years of age

Inclusion criteria :
1. Age 30-60 yrs
2. Post Myocardial infarction patients

EXCLUSION criteria :
1.Elderly >60 yrs
2.Complete heart block
3.Atrial fibrillation
4.Chronic Kidney disease
5. Chronic Obstructive Lung Disease
6 .Heart valve abnormalities
7 Prior history of heart failure
8.Cardiomyopathies

Study period :
18 months (AUG 2019 -TO- FEB 2021)

Sample size :
144

Formula :
4pq/d2 p =23 q =77 d =7

Sampling technique :
Convenient sampling

Study Instruments:
Structured pretested questionnaire.Each of the participants were asked pre-specified questions according to the Proforma . Blood samples were collected for laboratory investigations. RBS ,FBS, PPBS ,HbA1c ,TFT, blood urea , serum creatinine , serum lipid profile, urine albumin , chest X-ray , ECG , ECHO using tissue doppler other blood , urine routine and fundus examination were done.

Data collection:
Primary data was collected by the investigator by interview method

Echocardiogram for diastolic dysfunction. Diastolic function was assessed by pulse-wave Doppler examination of mitral flow (before and during Valsalva maneuver), pulmonary venous flow, and Doppler imaging of the medial mitral annulus.

Definitions
Diastole:It is part of the cardiac cycle which starts with the isovolumetric relaxation phase and ends with cessation of mitral inflow

Phases of diastole
a) Isovolumetric Relaxation Phase
In this phase there is no LV filling, but it has an impact on filling of LV in the subsequent phase. This is an active phase and requires lot of energy.
b) Rapid Filling Phase
Major portion of the ventricular filling occurs during this phase and is governed by myocardial relaxation, mitral valve gradient and myocardial compliance.
c) Slow Filling Phase
This is dependent on the passive compliance or stiffness of ventricle. Very little filling occurs during this phase.
d) Atrial systole

The contribution of atrial contraction towards ventricular filling depends on the LV compliance and rhythm of the patient. Normally the atrial contraction contributes upto 15% of LV filling. But if the LV is less compliant the contribution may increase to 30-35%.

Data entry and analysis :Data collected was entered in microsoft excel and analysed using SPSS version 20.Qualitative variables like sex was expressed in percentage and quantitative variables like age was expressed in Mean and standard deviation .Chi square test was used to test significance of difference between proportions .P <0.05 was considered statistically significant .

Ethical issues:
The study was started only after obtaining due permission from the Ethical Committee. No personal data obtained in the study was shared to anyone online or offline. The data obtained from the study was strictly confidential. Appropriate informed consent was obtained from study participants willing to be a part of the study, subject to inclusion & exclusion criteria**.**

Results:-

Table 1:- Age wise distribution of study participants.

Age in years	Frequency	Percentage	Mean ±S.D
31-40	21	15	
41-50	30	21	57.16±2.56
51-60	93	64	
Total	144	100	

Table 2:- Sex wise distribution of study participants.

Sex	Frequency	Percentage
Male	113	78
Female	31	22

Total	144	100

Table 3:- Prevalence of left ventricular diastolic dysfunction.

LVDD	**Frequency**	**Percent**
Present	80	56
Absent	64	44
Total	144	100.0

Table 4:- Association between risk factors and left ventricular diastolic dysfunction.

Risk factors	LVDD	No LVDD	P value
Smoking			
Yes	62	18	0.01
No	18	46	
Diabetes			
Yes	78	12	0.01
No	2	52	
Hypertension			
Yes	68	10	0.01
No	12	54	
Type of MI			
Anterior wall MI	36	14	0.56
Inferior wall MI	44	50	

Figure 1:- Agewise distribution of study participants.

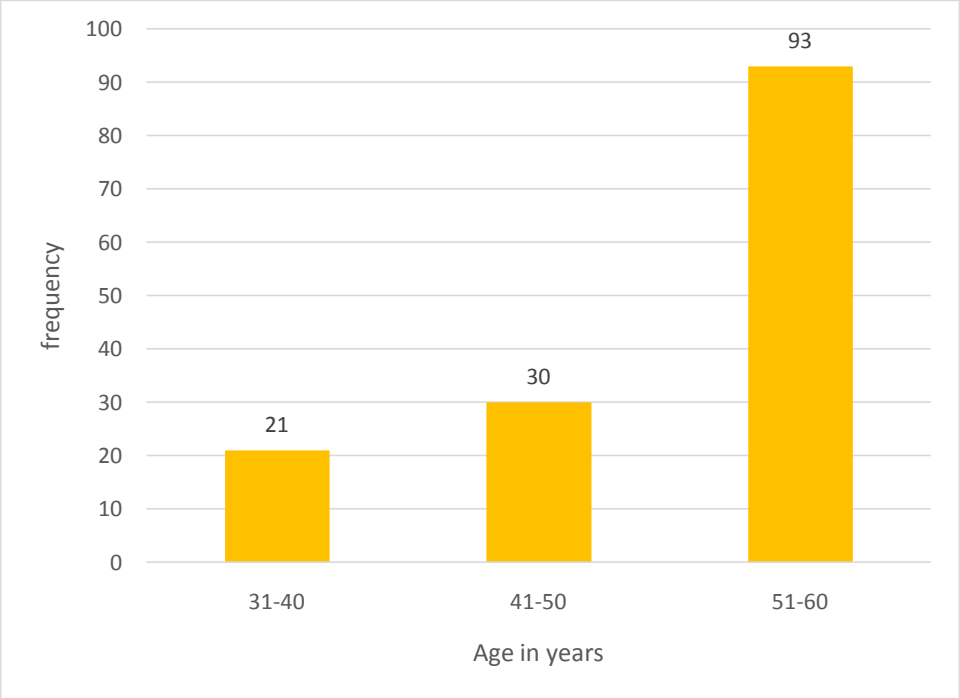


Figure 2:- Sexwise distribution of study participants.

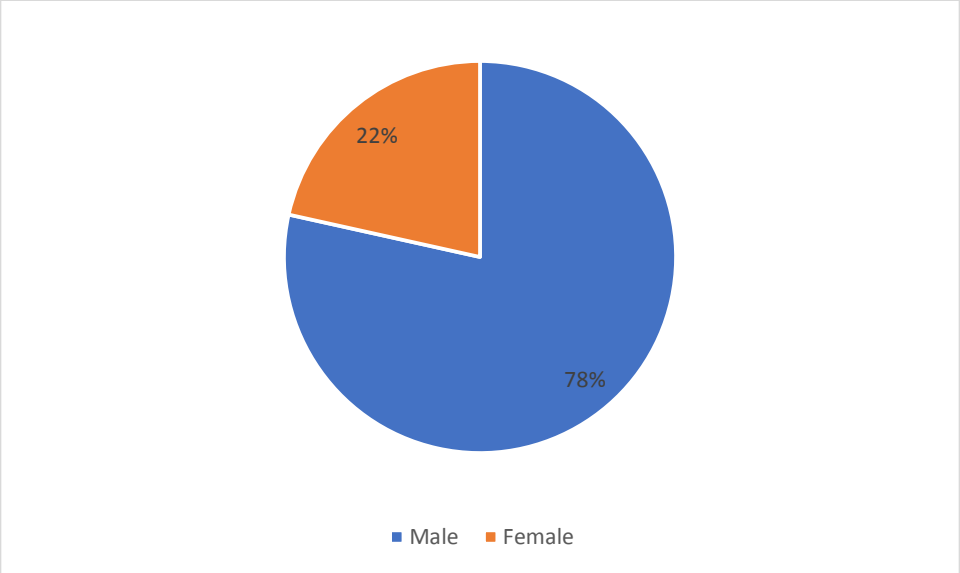
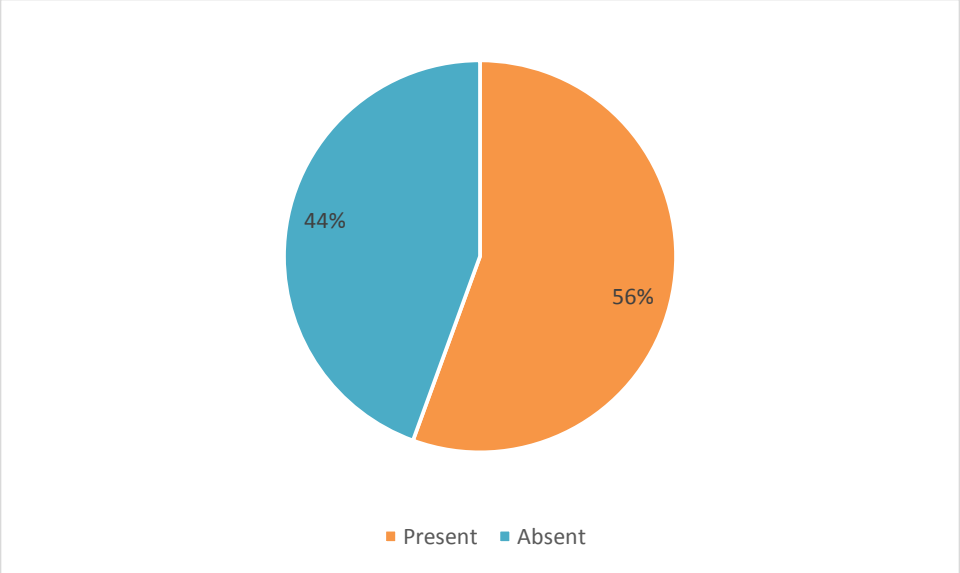


Figure 3:- Prevalence of left ventricle diastolic dysfunction.



Discussion:-

In the present study majority of the study participants were in the age group of 51 to 60 years (64%).Mean age is 57.16 and standard deviation is 2.56.About 78% were males and 22% were females .Prevalence of left ventricular diastolic dysfunction is 56%.There is statistically significant association between risk factors like smoking ,hypertension ,diabetes and occurrence of left ventricular diastolic dysfunction($P<0.05$).There is no association between type of Myocardial infarction and left ventricular diastolic dysfunction .

Community population studies report that approximately half of the patients with heart failure have preserved LVEF.[7] The current longitudinal data confirm and extend the cross-sectional association reported between age and diastolic dysfunction: over a 4-year interval, middle-aged and elderly persons were 3 times more likely to manifest poorer diastolic function than better diastolic function.[8-11] That diastolic dysfunction worsened even in healthy persons supports the concept that aging may be accompanied by progressive deterioration in diastolic function. This age-related progression of diastolic dysfunction in the population contributes to the pathophysiologic substrate from which overt heart failure emerges. The biological pathways leading to heart failure with preserved LVEF are manifold, and understanding its pathophysiology remains a work in progress. Contributing factors include changes

in myocardial relaxation and elastic recoil, changes in ventricular load and diastolic stiffness, external constraint, and abnormal systolic function.[12-15]

Indeed, previous cross-sectional analyses from OCHFS cohort have shown significant correlations between age and vascular, ventricular endsystolic, and ventricular end-diastolic stiffness. An important clinical implication may be that prevention of risk factors for superimposed events, especially hypertension, might be fundamental to reducing heart failure with preserved LVEF

Conclusion:-

Worsening diastolic function can be detected even in apparently healthy persons. Although confirmation in other studies would be helpful, our data suggest that persistence or progression of diastolic dysfunction is a risk factor for heart failure in post myocardial infarction patients.

References:-

1. Dalen JE, Alpert JS, Goldberg RJ, Weinstein RS. The epidemic of the 20th century: coronary heart disease. Am J Med. 2014 Sep;127(9):807-12.
2. Pearson TA. Cardiovascular disease in developing countries: Myths, realities, and opportunities. Cardiovasc Drugs Ther. 1999; 13(2): 95–104.
3. Murray CJL, Lopez AD. Mortality by cause for eight regions of the world: Global
4. Burden of Disease Study. Lancet. 1997; 349(9061): 1269–1276.
5. Bonow RO, Smaha LA, Smith SC, Mensah GA, Lenfant C. World Heart Day 2002: The International Burden of Cardiovascular Disease: Responding to the Emerging
6. Global Epidemic. Circulation. 2002; 106(13):1602–1605.
7. World Health Organization. The World Health Report 2002: Reducing risks, promoting healthy life. Geneva: WHO; 2002.
8. Antman EM, Braunwald E. ST-segment elevation myocardial infarction. In Fauci AS, Kasper DL, Braunwald E, Hauser SL, Longo DL, Jameson JL ed. Harrison's Principles of Internal Medicine. 17th ed, USA: McGraw-Hill; 2008.p. 1532.
9. 7.Redfield MM, Jacobsen SJ, Burnett JC Jr, Mahoney DW, Bailey KR, Rodeheffer RJ. Burden of systolic and diastolic ventricular dysfunction in the community: appreciating the scope of the heart failure epidemic. JAMA. 2003;289(2):194-202.
10. 8. Davies M, Hobbs F, Davis R, et al. Prevalence of left-ventricular systolic dysfunction and heart failure in the Echocardiographic Heart of England Screening study: a population based study. Lancet. 2001; 358(9280):439-444.
11. 9. Abhayaratna WP, Marwick TH, Smith WT, Becker NG. Characteristics of left ventricular diastolic dysfunction in the community: an echocardiographic survey. Heart. 2006;92(9):1259-1264.
12. 10. Vasan RS, Larson MG, Benjamin EJ, Evans JC, Reiss CK, Levy D. Congestive heart failure in subjects with normal versus reduced left ventricular ejection fraction: prevalence and mortality in a population-based cohort. J Am Coll Cardiol. 1999;33(7):1948-1955.
13. 11. Owan TE, Hodge DO, Herges RM, Jacobsen SJ, Roger VL, Redfield MM. Trends in prevalence and outcome of heart failure with preserved ejection fraction. N Engl J Med. 2006;355(3):251-259
14. 12. Ommen SR, Nishimura RA, Appleton CP, et al. Clinical utility of Doppler echocardiography and tissue Doppler imaging in the estimation of left ventricular filling pressures: a comparative simultaneous Doppler-catheterization study. Circulation. 2000; 102(15):1788-1794.
15. 13. Nishimura RA, Tajik AJ. Evaluation of diastolic filling of left ventricle in health and disease: Doppler echocardiography is the clinician's Rosetta Stone. J Am Coll Cardiol. 1997;30(1):8-18.
16. 14. Hurrell DG, Nishimura RA, Ilstrup DM, Appleton CP. Utility of preload alteration in assessment of left ventricular filling pressure by Doppler echocardiography: a simultaneous catheterization and Doppler echocardiographic study. J Am Coll Cardiol. 1997; 30(2):459-467.
17. 15. Redfield MM. Understanding "diastolic" heart failure. N Engl J Med. 2004;350(19):1930-1931.