Original Article

# PREVALENCE OF ASYMPTOMATIC CORONARY ARTERY DISEASE ON 99M TC-SESTAMIBI SPECT IN CHRONIC KIDNEY DISEASE PATIENTS

Muhammad Irfan Tahir Khan[a], Muhammad Ammar Rashid[b*], Muhammad Atif Imran[b], Aamir Hussain[b], Ahmad Noeman[b], Muhammad Ayub[b]

ABSTRACT

OBJECTIVE: This study was conducted to evaluate the prevalence of asymptomatic coronary artery disease on 99mTC-Sestamibi SPECT in chronic kidney disease patients.

MATERIAL AND METHODS: This descriptive, cross- sectional study was conducted at the Nuclear Medicine Department of Punjab Institute of Cardiology, Lahore from: 07-03-2013 to 06-09-2013 (Six Months). A total of 100 asymptomatic patients with CKD age ranging from 30-70 years of both genders with GFR less than 60ml/min/1.73m$^2$ for 3 months were included.

Patients with baseline electrocardiogram with ST-T wave changes or Q wave (changes suggestive of ongoing ischemia or an old infarct), past history of ischemic heart disease, myocardial infarction, congestive cardiac failure, post angioplasty, coronary artery bypass grafting, renal transplant and peripheral vascular disease / cerebro-vascular accident (stroke/ TIA) were excluded.

RESULTS: In our study, 9 % (n=9) were between 31-40 years, 21 % (n=21) between 41-50 years, 48% (n=48) between 51-60 years and 22% (n=22) had >60 years of age, mean+sd of age was calculated as 53.25+9.09 years. Regarding gender distribution of the patients 55% (n=55) male and 45% (n=45) were female. Frequency of asymptomatic coronary artery disease on 99mtc-sestamibi SPECT in chronic kidney disease patients was 49% (n=49) while 51% (n=51) had no findings of the morbidity.

CONCLUSION: In this study we recorded a significantly higher frequency of asymptomatic CAD on 99mTC-Sestamibi SPECT in chronic kidney disease patients in agreement with other international studies, but the data in our country is primary, however, more trials must be done to authenticate the findings of the study.

KEYWORDS: Chronic kidney disease, asymptomatic coronary artery disease, 99mTC-Sestamibi SPECT.

## INTRODUCTION:

Patients with chronic kidney disease with or without dialysis are at a higher risk of ischemic heart disease due to multiple risk factors associated with renal disorders. Death from cardiac causes accounts for 40%-50% of all deaths in chronic kidney disease patients and is thus up to 20 times more common in CKD patients than in the general population.[1]

Asymptomatic coronary artery disease in dialysis patients should be assessed very differently from asymptomatic coronary artery disease in normal population. The absence of symptoms is due to impaired exercise tolerance and uremic autonomic neuropathy. Hemodynamically significant stenosis may not become clinically apparent and presence of silent ischemia may cause heart failure, arrhythmias, and sudden death.[2]

Conventional cardiac risk stratification strategies, which are used to assess the functional consequences of coronary artery disease, appear to have a lower accuracy in this population. Stress MPI (myocardial perfusion imaging) is often the only risk stratification tool to be used in CKD patients.[3] Dipyridamole-Myocardial perfusion scan have demonstrated sensitivities and specificities of 80–90% in the diagnosis of CAD.[4] The sensitivity and specificity of combined dipyridamole-exercise Myocardial perfusion scan in hemodialysis patients were 92 and 89 % respectively.[5] With a negative predictive value of 92% stress myocardial perfusion scan may reduce the need for unnecessary coronary angiography.[6] The sensitivity of dipyridamole 99mTc sestamibi imaging has been compared favourably to thallium scintigraphy.[7] Due to hepatic excretion 99mTC-Sestamibi is more preferable to thallium in patients of chronic kidney disease.[8]

[a]Sir Ganga Ram Hospital, Lahore Pakistan.
[b]Punjab Institute of Cardiology, Lahore Pakistan.
* Corresponding author:
Email:drammar90@yahoo.com

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Clinical data from different studies has shown that CKD is the independent predictor of CAD and CKD patients are more prone to major cardiovascular events. Furthermore myocardial perfusion SPECT have a highly incremental value for predicting the cardiac prognosis of patients with chronic kidneys disease.[9-13]

Rationale of our study was to assess that a large number of CKD patients suffer from CAD. However, due to reduced exercise capacity and uremic autonomic neuropathy, most of chronic kidney disease patients remain asymptomatic, so they are never treated for coronary artery disease and thus suffer major adverse cardiac events. Limited data is available on the subject and few studies have shown wide variation in their results, moreover, no study has been conducted to assess the disease burden of asymptomatic coronary artery disease in chronic kidney disease patients in Pakistani population. So, if the study results show huge burden of asymptomatic coronary artery disease in our population then as a rule in future this high risk population should be screened for coronary artery disease, and if required intervention should be done to reduce the mortality in this population.

## OBJECTIVE:

Objective of the study was to evaluate the prevalence of asymptomatic coronary artery disease on 99mTC-Sestamibi SPECT in chronic kidney disease patients.

## OPERATIONAL DEFINITION:

Chronic Kidney Disease:

- Chronic kidney disease was defined as GFR <60 ml/min/1.73 $m^2$ for 3 months.

Asymptomatic Coronary artery Disease:

- Asymptomatic coronary artery disease was defined as no symptoms of chest pain, previous history of myocardial infarction and normal surface ECG and a perfusion defect on MPI that was only present during stress and not at rest.

## MATERIAL AND METHODS:

This descriptive, cross- sectional study was conducted at the Nuclear Medicine Department of Punjab Institute of Cardiology, Lahore from 07-03-2013 to 06-09-2013 (Six Months). A total of 100 asymptomatic patients with CKD with age ranging from 30-70 years of both genders and GFR less than 60ml/min/1.73$m^2$ for 3 months were included.

Patients with baseline electrocardiogram with ST-T wave changes or Q wave (changes suggestive of ongoing ischemia or an old infarct), past history of ischemic heart disease, myocardial infarction, congestive cardiac failure, post angioplasty, coronary artery bypass grafting, renal transplant and peripheral vascular disease / cerebro-vascular accident (stroke/ TIA) were excluded.

Informed consent from the patients was taken. All patients were evaluated in detail for their clinical presentations. Patients were asked for chest pain (onset, character, duration and severity), shortness of breath, palpitations and pre-syncope and they were subjected to precordial and chest auscultation. ECG of these patients was taken to see for ST and T wave changes. All diagnosed patients of chronic kidney disease undergoing myocardial perfusion SPECT as a routine screening test were included in the study.

Myocardial perfusion single photon emission computed tomography (SPECT) was performed on Siemens ecam® dual head variable angle gamma camera with single day stress rest protocol in all cases. Dipyridamole (0.14mg/kg/min) was infused over 4 min, with monitoring of symptoms by electrocardiography, heart rate, and blood pressure. This was coupled with sub maximal exercise on ergometer up to 75 Watts. Three minutes after infusion, 370 MBq of 99mTC-Sestamibi was injected and stress images were obtained 30 minutes later. Re-injection of 1110 MBq 99mTC-Sestamibi was given 3 hours later and rest images were acquired one hour after the injection, while the patients were at rest. Data was transferred and processed on Siemens esoft® workstation. Stress and Rest raw data was reconstructed to generate short, vertical long and horizontal long axis slices. Corresponding stress and rest slices were displayed together for evaluation of perfusion defects and reversibility. Reversible images were considered to be positive test.

Data was entered into a computer using Statistical Package for Social Sciences (SPSS) version 16.0 for Windows®. Categorical variables (Diabetes, Hypertension, Family history, Smoking and Hyperlipidemia) and asymptomatic coronary artery disease on 99mTC-Sestamibi SPECT in chronic kidney disease patients were mentioned as frequencies, percentages and graphs. Continues variables (age) was expressed as mean + standard deviation (SD). As this is an observational study, so no test of significance was applied.

## RESULTS:

A total of 100 cases fulfilling the inclusion/ exclusion criteria were enrolled to evaluate the prevalence of asymptomatic coronary artery disease on 99 MTC-Sestamibi SPECT in chronic

Table No. 1: Age Distribution of the Patients (n=100)

| Age(in years) | No. of patients | % |
|---|---|---|
| 31-40 | 9 | 9 |
| 41-50 | 21 | 21 |
| 51-60 | 48 | 48 |
| 60-70 | 22 | 22 |
| **Total** | 100 | 100 |

Table No. 2: Gender Distribution of the Patients (n=100)

| Gender | No. of patients | % |
|---|---|---|
| Male | 55 | 55 |
| Female | 45 | 45 |
| Total | 100 | 100 |

Table No. 3: Frequency of CO-Morbidities (n=100)

| Co-morbidities | No. of patients | % |
|---|---|---|
| **Diabetes Mellitus** | 60 | 60 |
| **Hypertension** | 67 | 67 |
| **Family history** | 31 | 31 |
| **Smoking** | 27 | 27 |
| **Hyperlipidemia** | 51 | 51 |

Table No. 4: Frequency of asymptomatic coronary artery disease on 99mtc-sestamibi spect in chronic kidney disease patients (n=100)

| Asymptomatic coronary artery disease | No. of patients | % |
|---|---|---|
| Yes | 49 | 49 |
| No | 51 | 51 |
| **Total** | **100** | **100** |

kidney disease patients.

Age distribution of the patients was done which shows that 9% (n=9) were between 31-40 years, 21% (n=21) between 41-50 years, 48% (n=48) between 51-60 years and 22% (n=22) had >60 years of age, mean + sd was calculated as 53.25+9.09 years. (Table No. 1)

Gender distribution of the patients shows 55% (n=55) male and 45% (n=45) were females. (Table No. 2)

Frequency of co-morbidities was recorded as 60% (n=60) for diabetes mellitus, 67% (n=67) had hypertension, 31%(n=31) had family history of CAD, 27%(n=27) had smoking, 51% (n=51) had hyperlipidemia . (Table No. 3)

Frequency of asymptomatic coronary artery disease on 99mtc-sestamibi SPECT in chronic kidney disease patients was revealed in 49 % (n=49) while 51 %(n=51) had no findings of the morbidity. (Table No. 4)

## DISCUSSION:

Coronary artery disease (CAD) is the major cause of morbidity and mortality.[14] Early diagnosis of CAD is important to prevent progression and clinical events. In patients with chronic kidney disease (CKD) undergoing renal replacement therapy (RRT), cardiovascular disease has a great impact on morbidity and mortality. Cardiac death accounts for almost 40% of total deaths among patients who receive RRT; and approximately 20% of these deaths are due to acute myocardial infarction (AMI).[15-16]

Conventional cardiac risk stratification strategies, which are used to assess the functional consequences of CAD appear to have a lower accuracy in this population. Stress MPI is the only diagnostic tool that can be advised to CKD patients.

We planned this study considering the fact that a large number of chronic kidney disease patients suffer from coronary artery disease in our country. However, due to reduced exercise capacity and uremic autonomic neuropathy, most of chronic kidney disease patients remain asymptomatic and never treated for coronary artery disease and thus suffer major adverse cardiac events.

The findings of the current study regarding frequency of asymptomatic CAD in chronic kidney disease patients is in agreement with a study by Sonavane[1] et al. in which 92 asymptomatic chronic kidney disease cases were enrolled and among them 58 (63%) were positive on myocardial perfusion imaging (MPI). Another study by Hase[9] et al. showed that among 112 patients with asymptomatic chronic kidney disease, coronary artery disease was present in 47 patients (42%) who had a higher cumulative major adverse cardiac event than patients without coronary artery disease.

Another study by Kim[10] et al. of 227 patients of chronic kidney disease on peritoneal dialysis revealed that chronic kidney disease was an independent predictor of coronary artery disease with 51 patients (22.5%) being positive for thallium SPECT study. The reason for disagreement with this study may be geographical variation in population,

difference in sample population and difference in frequencies of co morbidities (Diabetes, Hypertension, Smoking, Hyperlipidemia and Family History) of patients all of which are also independent risk factors for coronary artery disease.

The results of the current study may be considered as primary and more trials must be done to confirm the findings as we are having limited data on the subject and few studies[a] have done with wide variation in their results, moreover, no study has been conducted to assess the disease burden of asymptomatic coronary artery disease in chronic kidney disease patients in Pakistani population. However, as a rule in future this high risk population should be screened for coronary artery disease on 99MTC-Sestamibi SPECT, and if required intervention should also be done to reduce the mortality in this population.

## CONCLUSION:

In this study we recorded a significantly higher frequency and risk stratification of asymptomatic coronary artery disease on 99mTC-Sestamibi SPECT in chronic kidney disease patients in agreement with other international studies, but the data in our country is primary, however, more trials must be done to authenticate the findings of the study.

## Author's Contribution

MITK: Conducted study and wrote the article MAR: Helped in study, reviewed the article and reanalyze data and corrected the article. MAI: Table and figures. AH, AN and MA: were consultant incharge of the study and gave frequent advices and did the proof reading.

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