

# Frequency of Exercise Induced Myocardial Ischemia in Asymptomatic Diabetic Patients

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## Objective

1. To study the frequency of exercise induced myocardial ischemia in asymptomatic diabetic patients with normal resting ECG,
2. To correlate the associated risk factors with positive exercise stress electrocardiography result.

## Methodology

This is a cross sectional study of consecutive patients attending out patient departments of Bir Hospital and Sahid Gangalal National Heart Center, Kathmandu. The study was conducted between May 2004 and November 2005. Detailed history was taken from each patient. The patients underwent physical examination, biochemical tests, chest x-ray, resting ECG and a screening echocardiogram prior to undergoing an exercise stress electrocardiography(ESE). The inclusion criteria were diabetic patients with normal resting ECG and a screening echocardiogram prior to undergoing an exercise stress electrocardiography. The inclusion criteria were diabetic patients with normal resting ECG above the age of 35 without any symptoms of coronary artery disease, who were physically able to perform the test and who gave consent for the test. Current smokers or those with past history of myocardial infarction, congenital heart disease, valvular heart disease or any significant systemic disease were excluded from the study. Exercise tests were graded as positive if the electrocardiography showed planar or down sloping ST-segment depression of  $>1$  mm in more than two leads at 80 ms post J point or if there was a blood pressure fall  $\geq 10$  mm Hg after an initial rise. Data analysis was done using Chi-square test, student t-test and logistic regression with SPSS software program.

## Result

30 patients who had given informed consent underwent the test and achieved the target heart rate. The mean age of the patients was  $51.23 \pm 7.82$  years, 76.7% were men and 23.3% were women. The patients with duration of diabetes up to 5 years were 43.3%, from 5 to 10 years were 43.3% and those with more than 10 were 13.3%, 53.3% of the patients were non-smokers and 46.7% were ex-smokers. There was no complication during the ESE procedure, 7 patients were found to have a positive ESE result making the frequency of 23.3%. When the cutoff point for total cholesterol was taken as  $> 200\text{mg/dl}$  being abnormal, univariate analysis showed an odds ratio of 16.67 (95% CI 2.17-128.18) with P value of 0.007, i.e. patients are 16 times more likely to suffer from CAD if patients have diabetes mellitus and a high total cholesterol level. The p value of other risk factors was not significant in the univariate analysis. The other risk factors having a higher odds ratio were as follows:

Duration of diabetes $\geq 10$ years	5.00
Triglyceride $\geq 200$ mg/dl	3.56
2 hours post prandial glucose	3.25
Microalbumiuria/proteinuria	2.67
LDL $>100$ mg/dl	2,29

Diabetes with hypertension had an odds ratio of 0.79 only, this is probably due to low number of hypertensive patients in the study and those who had hypertension were under medication and their blood pressures were controlled.

Similarly, multivariate analysis showed that total cholesterol as a risk factor for CAD had the highest odds ratio of 23.31 with a significant P value of 0.026. The P value for other risk factors with higher odds ratio were as shown below.

Duration of diabetes $\geq 10$ years	11.41
Ex - Smokers	8.10
Microalbumiuria/proteinuria	4.50
Triglyceride $> 200$ mg/dl	2.09

Analysis was done for more than three risk factors and it showed to have an odds ratio of 11.88 (95% CI 1.67-84.52) with significant P value of 0.013. The P value for two or three risk factors was not significant. The risk factors were not significant. The risk factors considered for the analysis were age, duration of diabetes, dyslipidemia, ex-smoker status, hypertension and proteinuria / microalbuminuria.

## **Conclusion**

The study shows that almost one fourth of the asymptomatic diabetic patients with normal resting ECG had a positive ESE result highlighting a very high frequency of possible CAD in the diabetic population. Total cholesterol of more than 200 mg/dl appeared to have the most predictive value for a positive ESE result in the univariate analysis. Multivariate analysis revealed that asymptomatic patients with diabetes and more than three risk factors were 12 times more likely to have positive ESE result, Thus, this study highlights that diabetic patients should be properly managed not only for raised blood glucose levels, but also for other associated cardiovascular risk factors. Prior to starting a vigorous exercise program or before a major surgery on diabetic patients with high risk factors, an exercise stress electrocardiography is advisable even if the patient is asymptomatic.