

Correlation between Duration of Illness and Treadmill Test in Type II Diabetes Mellitus Patients

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Abstract: ***Background:** Diabetes is a common endocrine disorder that leads to multiple systemic complications. There is a link between diabetes and coronary artery disease for many years. It plays an important role in atherogenesis and causes cardiovascular morbidity and mortality. The duration of diabetes seems to influence the rapidity of atherogenesis. The treadmill test is a relatively inexpensive tool to screen patients with diabetes for coronary artery disease. **Aim and Objective:** To use treadmill test in patients with type II diabetes mellitus and correlate with sociodemographic data and the duration of diabetes. **Materials and methods:** This was a cross-sectional observational study that was done among 79 diabetic patients who underwent treadmill test from a tertiary care hospital at Mangalore. The result of the treadmill test, sociodemographic profile, and duration of diabetes were obtained and analysed using SPSS software v20. **Results:** Among 79 diabetic subjects, 21 (26.3%) were females and 58 (73.8%) were males. The mean±SD age was 56.89±10.87 years. The duration of diabetes ranged from newly detected diabetics to 40 years with mean±SD of 7.43±7.28 years. Among the 79 participants, 27 were positive for inducible ischemia after TMT, 26 were negative and 16 showed an inconclusive result. Statistically significant results were observed between the duration of diabetes and a positive treadmill test. **Conclusion:** The increasing duration of diabetes was associated with a positive treadmill test. Early identification and control of diabetes, use of treadmill tests could prevent mortality from coronary artery disease in patients with diabetes.*

Keywords: Diabetes, treadmill test, coronary artery disease, TMT

1. Introduction

A significant link between Type II diabetes mellitus and coronary artery disease has been established for many years. The earliest sign of coronary artery disease in diabetics usually are very subtle and they usually do not present until immediately before its onset. The duration of diabetes, presence of other morbid conditions seems to influence the rapidity of onset of symptoms. Almost 75-80% of diabetics die of cardiovascular diseases with the additional risk of dyslipidaemia further compounding the problem. [1] In patients with diabetes mellitus the risk of mortality after myocardial infarction is greater when compared to other illnesses. [2]

According to ADA guidelines, the diagnosis of diabetes is established when Fasting plasma glucose is more than 126 mg/dL (7.0 mmol/L) or 2 hours postprandial plasma glucose is more than 200 mg/dL (11.1 mmol/L) or HbA1c is more than 6.5% (48 mmol/mol). [3] Clinical studies have found that vasodilation mainly mediated by Nitric Oxide is abnormal in patients with type 1 or type 2 diabetes. Thus, decreased levels of NO in diabetes may explain the accelerated atherogenesis in the patients. [4-7]

The incidence and prevalence of coronary artery disease are widely unknown in India largely due to inadequate availability of resources and scarcity of screening among diabetics. Multiple studies done outside India shows prevalence rates of 9%-59%. [8-10] This broad range of prevalence is probably due to the difference in population in which the studies are done and the lack of protocol in screening patients with diabetes for coronary artery disease. It is also due to the various screening methods used such as TMT, Resting ECG, stress ultrasound, and coronary

angiogram. This study is mainly aimed at determining the use of Treadmill test in evaluating patients with asymptomatic diabetes mellitus.

2. Materials and methods

2.1 Methodology

This is a descriptive cross-sectional study conducted among 79 patients diagnosed with type II diabetes mellitus with ADA guidelines, (3) undergoing a treadmill test availing OP services of Father Muller Medical College Hospital, Mangalore. Institutional ethical committee clearance was obtained prior to the study. Sample size of 79 subjects was calculated using the formula: $n = (Z^2 \times P(1/P))/e^2$ Where Z=confidence level at 95% (standard value of 1.96) P=Estimated prevalence [11] and E=allowable error for e=5%. Case records of patients who underwent treadmill test according to the modified Bruce protocol from the hospital IP/OP records will be surveyed and analysed for the presence of diabetes and duration of diabetes. [12] History, examination, and duration of diabetes, results will be charted as per a pre-formatted datasheet.

2.2 Inclusion criteria

Those diagnosed with type II diabetes mellitus as per ADA guidelines.

2.3 Exclusion criteria

- Patients with a previous history of peripheral vascular disease
- History of Percutaneous transluminal coronary angioplasty, Coronary artery bypass grafting in the past.

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2.4 Analysis

Data will be analysed using SPSS V20 and results will be interpreted as frequencies, percentages, mean, standard deviation, percentiles and Kruskal Wallis test.

3. Results

There were 21 females (26.3%) and 58 males (73.8%). The age varied from 33-87 years with mean±SD age being 56.89±10.87 years. The duration of diabetes ranged from newly detected diabetics to 40 years with mean±SD of 7.43±7.28 years. Among the 79 participants, 27 were positive for inducible ischemia after TMT, 26 were negative and 16 showed an inconclusive result. (Table 1, Table 2)

Table 1: Demographic factors with TMT

Parameters		TMT					
		Positive		Negative		Inconclusive	
		Count (N)	N %	Count (N)	N %	Count (N)	N %
Sex	Female	8	38.1%	6	28.6%	7	33.3%
	Male	19	32.8%	30	51.7%	9	15.5%
	Total	27	33.8%	36	46.2%	16	20.0%
Age	40 and below	1	12.5%	5	62.5%	2	25.0%
	41 - 60	15	38.5%	20	51.3%	4	10.3%
	Above 60	11	34.4%	11	34.4%	10	31.3%
	Total	27	33.8%	36	46.2%	16	20.0%
Duration of Diabetes	New	4	26.7%	10	66.7%	1	6.7%
	1 - 5	7	29.2%	14	58.3%	3	12.5%
	6 - 10	9	47.4%	6	31.6%	4	21.1%
	Above 10	7	33.3%	6	28.6%	8	38.1%
	Total	27	33.8%	36	46.2%	16	20.0%

Table 2: Age and duration of diabetes

	N	Mean	Std. Deviation	Percentiles		
				25	Median	75
Age	79	56.89	10.873	52.00	57.50	64.00
Duration of Diabetes	79	7.430	7.2816	2.000	6.000	11.750

Association with age:

The age showed minimum age of 33 years and maximum age of 87 years with a mean±SD age of 56.89±10.87 years. The correlation between the categories of TMT was not significant at p=0.12. (Table 3)

Association with sex:

Of the 79 participants, 58 are males and 21 are females. Gender did not show any correlation with the results of TMT. (Table 3)

Table 3: Association of TMT with age and sex

TMT with the Following parameters	Chi square/Fishers exact test p-value	Significance
Sex	0.100	Not significant
Age	0.129	Not significant

Association with duration of diabetes:

The duration of diabetes ranged from newly detected diabetics to 40 years with mean±SD of 7.43±7.28 years. The duration of diabetes significantly correlated with TMT at p=0.005. (Table 4)

Table 4: Association of duration of diabetes with TMT

TMT	N	Mean	Std. Deviation	Kruskal wallis test p value	
Positive	27	6.90	5.47	.005	Significant
Negative	37	5.11	4.98		
Inconclusive	16	13.69	10.59		

4. Discussion

TMT is being used throughout the world as a non-invasive way to detect silent myocardial ischemia. 33.8% of diabetics were positive in our study. This is more or less in accordance with numerous studies conducted in South Asia and India. [13] However, there is a wide range probably due to the differences in the population, protocols, and the influence of comorbidities within the study population.

The mean±SD age in our study is 56.89±10.87 years. Among the participants who were positive 1(3.7%) was below 40, 11(55.6%) were between 41-60 years and 15(40.7%) were above 60. In a study done by Kim et al the mean±SD age of participants who had positive TMT was 63.1±9.4. (13) Fletcher et al in his study concluded that patient with inducible ischemia has a mean±SD age of 67±9 years. A significant difference was noted with more age associated with an increased chance of TMT being positive. [14] However, in our study, no such correlation was noted. This may be since a significant proportion of the elderly yielded an inconclusive test.

Significant results were not obtained on the influence of sex on the likelihood of asymptomatic myocardial ischemia. In a study done by Daugherty et al, it was concluded that Treadmill test had similar prognostic value in both men and women barring only certain parameters. [15] However, in a study done by Sharda et al. showed that the prevalence of coronary artery disease in males is higher than that in females. [16]

This study found a significant association between the duration of diabetes and TMT results. The mean±SD duration of diabetics with positive TMT is 6.9±5.47 while that of diabetics with negative TMT is 5.11±4.98. Prasad et al. concluded that the duration of diabetes was significantly associated with positive TMT and it has to be taken under consideration when TMT is inconclusive.[17] In another study done by Ahluwalia et al, it was found that the duration of diabetes of more than 5 years was associated with significantly more positive tests than patients with a duration of less than 5 years.

5. Conclusion

Treadmill test is a simple but effective tool in screening patients with diabetes for coronary artery disease. Various factors influence TMT results in diabetics who are asymptomatic. Some of these factors are the presence of comorbidities such as dyslipidemia, hypertension, age, and duration of diabetes. Screening of these patients should be considered with a low threshold for diagnosing coronary artery disease considering the risk factors of which duration of diabetes playing a significant role.

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