

## ORIGINAL ARTICLE

# Correlation of Duke Treadmill Score with Coronary angiographic Findings in Patients with Stable Ischemic Heart Disease

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## ABSTRACT

**Aim:** To determine the correlation of Duke treadmill score with angiographically determined obstructive coronary artery disease (CAD)

**Study design:** observational cross sectional study, comparative type

**Place and duration:** The study was done at Cardiac Center Bahawalpur from August 2020 to July 2021.

**Methods:** The patients who had stable angina and underwent exercise tolerance testing as well as coronary angiography were included in the study. The data was collected on a predesigned proforma. The difference in the prevalence of obstructive CAD with regards to Duke treadmill score (DTS), gender, diabetes mellitus, hypertension, smoking and family history was determined with Chi square test using SPSS 20; ap value of < 0.05 was taken as significant.

**Results:** Total 71 patients were enrolled for study. Mean age of the participants was  $48.25 \pm 8.7$  years. It was a male dominant population. A significant difference in the prevalence of obstructive CAD was noted in low, intermediate and high risk groups according to DTS. The prevalence of obstructive coronary artery disease was not significantly different with regards to gender, diabetes mellitus, hypertension, smoking and family history. However obstructive CAD was more prevalent in those who presented with typical angina as compared to those who had atypical symptoms.

**Conclusion:** Obstructive CAD significantly differs in low, intermediate and high risk groups according to DTS.

**Keywords:** Duke treadmill score, coronary artery disease

## INTRODUCTION

Almost 50% of all deaths worldwide are attributed to coronary artery disease.<sup>1</sup> Stable angina pectoris is one of the manifestations of coronary artery narrowing. Stable angina is diagnosed on the basis of history, non-invasive stress testing including exercise stress testing (ETT), and invasively by coronary angiography<sup>2</sup>. The DTS which includes total exercise duration, change in the ST segment, and angina score is a good tool for prediction of risk for patients of stable angina<sup>3</sup>. The estimated 4-years cardiovascular survival of patients is 99% with low risk DTS, 95% with intermediate, and 79% with high risk DTS respectively. Therefore the patients who are low risk according to DTS are usually not referred for invasive coronary angiography<sup>4</sup>. Although coronary angiography is the gold standard investigation in the diagnosis of CAD, but because of risks associated with its invasiveness, ETT remains a good initial choice for the identification of CAD as well as for the determination of future risk<sup>3,5,6</sup>.

Muhammad A, et al<sup>1</sup> and Mohsen AS et al<sup>3</sup> have shown a significant association between DTS and extent of CAD. So we designed a study for establishing the correlation of DTS with coronary angiography findings in our population presenting to Cardiac Center Bahawalpur.

The study's objective was to find out the correlation of Duke Treadmill score with angiographic CAD

## MATERIALS AND METHODS

It was an observational cross-sectional comparative study that was done at Cardiac Center Bahawalpur from August 2020 to July 2021. All those patients who had symptoms of stable angina who had exercise tolerance testing and whose coronary angiography was done at our centre were enrolled in the study. The exclusion criteria were: (1) prior percutaneous coronary intervention (2) prior history of coronary artery bypass surgery (3) known case of cardiomyopathy (4) known case of valvular or congenital heart disease (5) baseline LBBB on ECG or paced rhythm. Typical angina was defined as retrosternal chest pain on exertion with at least one of the following features: (1) relieved by rest (2) relieved by taking sublingual nitroglycerine tablet or spray (3) radiation to left arm, lower jaw or epigastrium. Atypical angina was defined as

chest pain which didn't fulfil the criteria of typical angina, feeling of chest discomfort or heaviness on exertion, or feeling of epigastric pain on exertion without chest pain. Diabetes mellitus was defined as already diagnosed as a case of diabetes mellitus or HbA1C > 6.5%. Hypertension was defined as a known case of hypertension for more than one year. Smoker was defined as a person who smoked at least 5 cigarettes per day for the last one year. Single vessel CAD was labelled as single or multiple lesions causing more than 70% stenosis in a single epicardial coronary vessel. Double vessel CAD was labelled as single or multiple lesions causing more than 70% stenosis in two of the three epicardial coronary arteries. Triple vessel CAD was defined as single or multiple lesions causing more than 70% stenosis in all the epicardial coronary arteries. Non-obstructive CAD was labelled as no lesion causing > 70% stenosis in epicardial coronary vessels. Normal coronary arteries were defined as lack of angiographically detectable coronary atherosclerotic lesions. The data was collected on a predesigned proforma which included patient's age and gender, presence or absence of diabetes mellitus (DM), smoking, hypertension (HTN), and family history of CAD, exercise tolerance test parameters including Duke treadmill score, and the severity of coronary artery disease categorised as single, double, or triple vessel CAD, non-obstructive coronary arteries or normal coronary arteries. SPSS 20 was used to analyse the data. The age of the participants was given as mean  $\pm$  standard deviation while the gender, DM, HTN, smoking, family history of ischemic heart disease, and the presence or absence of typical angina were presented in the form of frequency and percentages. Based on angiographic findings, the patients were divided into two groups; one group having obstructive coronary artery disease which included the patients with single, double or triple vessel CAD and the other group had non-obstructive coronary artery disease which included the patients with non-obstructive or normal coronaries. The difference in the prevalence of obstructive CAD with regards to Duke treadmill score (DTS), gender, diabetes mellitus, hypertension, smoking and family history was determined with Chi square test; ap value of < 0.05 was taken as significant.

## RESULTS

Total 71 patients were enrolled for study. Mean age of the study participants was  $48.25 \pm 8.7$  years. It was a male dominant population (84.5%). Table 1 shows baseline parameters of the study participants.

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Table 1: Baseline parameters of patients

	n	Percentage (%)
<b>Gender</b>		
Male	60	84.5
Female	11	15.5
<b>Diabetes mellitus</b>		
Diabetic	22	31
Non-diabetic	49	69
<b>Hypertension</b>		
Hypertensive	11	15.5
Non-hypertensive	60	84.5
<b>Smoking</b>		
Smoker	20	28.2
Non-smoker	51	71.8
<b>Family History</b>		
Present	25	35.2
Absent	46	64.8
<b>Angina</b>		
Typical	15	28.1
Atypical	56	71.9

Obstructive CAD significantly differs in low, intermediate and high risk groups according to DTS ( $p = 0.03$ ) (Table 2).

Table 2. Correlation of DTS with significant CAD

DTS	Significant CAD		Total
	yes	no	
Low	7	8	15
Intermediate	26	16	42
High	12	2	14
Total	45	26	71

The prevalence of obstructive CAD does not significantly differ with regards to gender ( $p = 0.4$ ), diabetes ( $p = 0.08$ ), hypertension ( $p = 0.1$ ), smoking ( $0.5$ ), and family history of CAD ( $p = 0.08$ ). However obstructive CAD was more frequently found in patients who presented with typical angina as compared to those who had atypical symptoms ( $p = 0.03$ ). The correlation of obstructive CAD with the above variables is given in Table 3.

Table 3: Correlation of obstructive CAD with risk factors

	Obstructive CAD		Total
	Yes	No	
<b>Gender</b>			
Male	39	21	60
Female	06	05	11
<b>Diabetes mellitus</b>			
Diabetic	17	05	22
Non-diabetic	28	21	49
<b>Hypertension</b>			
Hypertensive	09	02	11
Non-hypertensive	36	24	60
<b>Smoking</b>			
Smoker	12	08	20
Non-smoker	33	18	51
<b>Family History</b>			
Present	19	06	25
Absent	26	25	46
<b>Angina</b>			
Typical	13	02	15
Atypical	32	24	56

## DISCUSSION

CAD is one of the leading causes of death in this era.<sup>7</sup>Duke Treadmill score is an important predictor of CAD<sup>8,9</sup> as well as the prognosis<sup>10</sup>. Zaman M et al<sup>11</sup> has described a higher incidence of non-fatal myocardial infarction in patients with high risk DTS and normal myocardial perfusion scan. The correlation of Duke treadmill score with the extent of CAD has already been described by several researchers including Muhammad A, et al<sup>1</sup> and Mohsen AS, et al<sup>3</sup>. The findings of our study are in line with Muhammad A, et al<sup>1</sup> and Mohsen AS, et al<sup>3</sup>, which reinforces the importance of Duke treadmill score. Prevalence of risk factors for CAD in our study was diabetes mellitus (31%), hypertension (15.5%), smoking (28.2%), family history (35.2%) which were different as compared to prevalence of these factors described by Rubiyaktho D, et al<sup>12</sup> which found prevalence of diabetes mellitus in 23.1%, hypertension in 51.9%, smoking in 35.3% and family history in 6.3% of patients. This finding reinforces the regional as well as ethnic differences in

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the trends of CAD and its risk factors. Another important inference from our results was that there was a significantly different prevalence of obstructive CAD in the patients who had typical symptoms of angina pectoris as compared to the ones who presented with atypical symptoms. This finding is in accordance with results published by Nakas G et al<sup>13</sup> and emphasizes that the patients with a typical history of angina pectoris merit particular attention and should be further investigated for the presence of CAD. Although it is an established fact that diabetes mellitus, smoking, HTN, family history of ischemic heart disease, and male gender pose a greater risk towards the development of CAD but our results failed to establish a significant association between any of these risk factors with obstructive CAD. Contradictory to our findings, Sundqvist P et al<sup>14</sup> has demonstrated gender differences in the prevalence of obstructive CAD with males having more chance of getting obstructive lesions diagnosed on coronary angiography. Gao Z et al<sup>15</sup> in a review has also highlighted the gender differences in CAD. The limitation of the current study was a small sample size, and a high percentage of male patients which may indicate a selection bias.

## CONCLUSION

Obstructive CAD significantly differs in low, intermediate and high risk groups according to DTS.

**Recommendation:** Duke treadmill score should be calculated in every patient undergoing treadmill stress testing and the patients with intermediate and high risk Duke treadmill score should be considered for further evaluation.

**Conflicts of interest:** No conflicts of interest

**Funding:** No funding from any source.

**Ethical Approval:** Done

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