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Original Research Article **Cardiology**

Coronary Angiographic Profile of the Diabetic Patients with Chronic Stable Angina and Grade –IV Diastolic Dysfunction

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Abstract

***Background*:** Ischaemia or infarction occurring due to Coronary Artery Disease (CAD) causes left ventricular systolic and Diastolic dysfunction (DD). DM speeds up the process of coronary atherosclerosis as well as functional and structural cardiac impairments, exhibiting DD at the early stages. Severity of CAD is best assessed by coronary Angiography (CAG). Early diagnosis of this condition is warranted as the mortality risk from it is high. The objective of this study was to detect the CAD in diabetic chronic stable angina with grade IV DD. ***Material and Methods*:** 74 Diabetic patients with chronic stable angina with grade-IV diastolic dysfunction were included in this cross-sectional observation study which was done in department of Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh from July 2023 to June 2024. ***Results*:** 32 (43.24%) subjects in rural and 42 (56.75%) subjects in urban areas. Proportion of males was 55%. Mean age of study population was (43 + 4.50) years. Mean age(57+7.0 vs 40+8.21years) in rural was significantly higher than urban subjects. 69 (51.06%) were SOB, 26 (19.24%) were tachycardic, 14 (10.36%) had bradycardia, 59 (43.66%) had hypotension, 21(15.54%) had raised JVP, 19(14.06%) had basal crepitation, 19(14.06%) had dependent oedema, 7(5.18%) had hepatomegaly and only 6(4.44%) had Ascites. Most of the dyspneic patients were in NYHA III stage. Around 30% patients were right dominant coronary artery. Most patients had significant stenosis in both LAD and LCX. About one third patients had insignificant stenosis in RCA. ***Conclusion*:** There is a relationship between coronary artery disease and Grade IV DD.

Keywords: Coronary Artery Disease (CAD), Diastolic Dysfunction (Grade IV), Diabetes Mellitus, Chronic Stable Angina, Coronary Angiography (CAG).

INTRODUCTION

IHD and stroke are responsible for majority of the CVD deaths in Asia [1]. The World Health Organisation (WHO) data showed IHD was the top cause of death globally in both 2000 and 2019; and it is responsible for the largest increase in deaths - more than 2 million- over the last two decades [2]. The spectrum of Stable Ischaemic Heart Disease (SIHD), which is currently designated as chronic coronary syndrome, is broad and includes individuals with chronic stable angina, asymptomatic ischaemia, prior myocardial infarction, prior coronary revascularisation, as well as individuals with non obstructive coronary atherosclerosis. It is also known that ischaemia or infarction occurring due to CAD causes left ventricular systolic and DDFx. DM speeds up the process of coronary atherosclerosis as well as functional and structural cardiac impairments, exhibiting DDFx at the early stages. Several studies have shown high incidence of DDFx among DM patients [3-5]. Severity of CAD is best assessed using invasive CAG although other non invasive method like Computed Tomography Coronary Angiography (CTCA) is available. The SYNTAX score are commonly used as angiographic grading tools to assess severity of CAD, and help in decision making for treatment. In the literature, results of the studies evaluating the relation between these scores and LV function are striking. Recently, Sahin DY *et al.*, demonstrated that although the LV systolic function remained normal, myocardial performance index value

was impaired in proportion to the severity of CAD in patients with SIHD [6]. Du LJ *et al*., concluded that an elevated left ventricular end-diastolic pressure was significantly associated with the extent and severity of coronary artery disease (CAD) [7]. Similarly, data from the Korean Women's Chest Pain Registry demonstrated a relationship between left ventricular diastolic dysfunction (DDFx) and the severity of CAD among women [8-12]. However, Abali G *et al*., reported that diastolic function did not show any impairment corresponding to the severity of CAD in patients with stable ischemic heart disease (SIHD) [9]. Additionally, Jamiel AR *et al*., suggested that the severity of CAD assessed by coronary computed tomography angiography (CTCA) is not independently associated with echocardiographic indicators of diastolic dysfunction in patients without previous CAD or left ventricular dysfunction [10]. Therefore, there are conflicting reports regarding relationship of DDFx and severity of CAD. This study was done to detect the severity of coronary artery disease in stage IV diastolic dysfunction.

MATERIALS AND METHODS

This Cross sectional observation study was done in Department of Cardiology, Bangabandhu Sheikh Mujib Medical University (BSMMU), on 74 Diabetic patients, aged between 18 to 70 years who were attended in outpatients with chronic stable angina with grade-IV diastolic dysfunction in department of Cardiology, BSMMU from July 2023 to June 2024.

Selection Criteria:

a) Inclusion Criteria: 74 Diabetic patients with chronic stable angina with grade-IV diastolic dysfunction.

b) Exclusion Criteria:

1. The patient who was not willing to participate in the study. (Non-consenting patient)
2. Patient with valvular heart disease
3. Patient with congenital heart disease
4. Patient with Ischemic cardiomyopathy or dilated cardiomyopathy.

Working Definition:

HFpEF or Diastolic Heart Failure:

This is a clinical syndrome characterized by breathlessness, fatigue and exercise intolerance whereby the dominant cardiac feature is impaired diastolic function (usually diagnosed by echo) and normal or near normal ejection phase indices. There is often LV hypertrophy and impaired filling of the heart due to altered LV stiffness or other evidence of diastolic dysfunction [12].

Method of Study:

The patients who admitted with short of breath in department of Cardiology, BSMMU were screened to include in this study. A written informed consent was obtained. History, clinical examination and investigation were done. Blood for NT Pro BNP, FBS, 2 hrs. ABF, HbA1c, creatinine, Fasting lipid peofile, TSH, CXR (P/A view) and Color Doppler echocardiography were done. Single operator has performed the color Doppler echocardiography. Ejection Fraction (EF) was measured by Modified Simpson Method by GE Vivid 7 Echocardiography machine with a transducer M4S. Tissue Doppler imaging (TDI) was done to detect diastolic dysfunction of LV who has manifested as chronic stable angina. Finally 74 diabetic symptomatic patients (HFpEF) who has normal LV systolic function but Grade IV diastolic dysfunction were included in this study. CAG was done in study population. Data was collected in preformed data sheet.

RESULTS

Total of 74 subjects were enrolled in the study. Table 1 shows 32 (43.24%) subjects in rural and 42 (56.75%) subjects in urban areas. Table 2 shows socio-demographic characteristics of study subjects, both rural and urban areas. Proportion of males was 55%. Mean age of study population was (43 + 4.50) years. Mean age in rural was significantly higher than urban subjects (57+7.0 vs 40+8.21) years. Clinical features in this chronic heart failure patients, 69 (51.06%) were SOB, 26 (19.24%) were tachycardic, 14 (10.36%) had bradycardia, 59 (43.66%) had hypotension, 21(15.54%) had raised JVP, 19(14.06%) had basal crepitation, 19 (14.06%) had dependent oedema, 7(5.18%) had hepatomegaly and only 6(4.44%) had Ascites. Most of the dyspneic patients were in NYHA III stage. Around 30% patients were right dominant coronary artery. Most patients had significant stenosis in both LAD and LCX. About one third patients had insignificant stenosis in RCA.

Table 1: Demographic characteristics of study subjects, both rural and urban areas

Back ground of study population	(N=74)	Percentage
Rural	32	23.68%
Urban	42	31.08%

Table 2: Clinical feature of chronic heart failure (N=74)

Clinical feature	Number	Percentage
Short of Breath	69	51.06%
Tachycardia	26	19.24%
Bradycardia	14	10.36%
Low BP (<90/60)	59	43.66%

Raised JVP	21	15.54%
Basal Creps	19	14.06%
Hepatomegali	07	5.18%
Ascitis	06	4.44%
Dependent Oedema	19	14.06%

Table 3: Stages of short of breath (N=69)

NYHA	Number	Percentage
Class I	0	0%
Class II	22	31.88%
Class III	26	37.68%
Class IV	21	30.43%

Table 4: Coronary angiography findings: (N=74)

	Number	percentage
Right dominant	41	30.34%
Left dominant	25	18.5%
Co-dominant	08	5.92%

Table 5: Lesion in coronary artery disease (N=74)

	Significant stenosis (n)	Nonsignificant stenosis (n)
LM	05	07
LAD	31	16
LCX	28	13
RCA	19	24
Ramus intermedius artery	02	05

DISCUSSIONS

Many of the same factors that contribute to atherosclerosis may also result in left ventricular DD by either direct mechanisms (e.g. hypertension and age-related vascular stiffening) or secondarily via CAD progression and resulting changes in myocardial ischemia [13]. Because at least half of the patients with diastolic dysfunction have prevalent CAD [14, 15], in the form of angina, previous myocardial infarction, or previous coronary artery bypass surgery [15-17]. This study showed similar result. Coronary artery disease (CAD) is often considered a key contributor to diastolic dysfunction (DD). However, the link between DD and stable or non-obstructive, asymptomatic CAD—independent of traditional risk factors—remains unclear. Previous studies have yielded conflicting results regarding this relationship. While some research suggests an inverse association between CAD and DD measurements, findings have been inconsistent. For example, Garcia *et al*., found that early subclinical atherosclerosis was negatively correlated with diastolic function parameters in otherwise healthy individuals, irrespective of age or clinical profile. However, they used carotid intima-media thickness as a surrogate for subclinical atherosclerosis instead of CACS [18]. In another study, Eleid *et al*., did not find consistent relation between coronary artery plaque burden as assessed by CACS and echocardiographic grade of LV DD in the population of asymptomatic adults with normal LV ejection fraction and negative cardiac stress test results [13]. Their study population was all grades of DD which was different from our study as we included only Grade IV DD. They included only 6% are diabetic patients whereas all our study population were diabetic. In another study, Lin *et al*., concluded that both the extent and severity of obstructive and non-obstructive CAD, as assessed by coronary CTA, are associated with elevated left ventricular end-diastolic pressure and worsening diastolic dysfunction parameters, which aligns with our findings [19]. However, their study protocol and patient population differed from ours.

CONCLUSION

A connection exists between coronary artery disease and Grade IV diastolic dysfunction. Nevertheless, several risk factors—including age, hypertension, diabetes mellitus, and dyslipidemia—play a contributory role in the development of both conditions. After adjusting for these confounders, it is difficult to detect an independent association between atherosclerosis and Grade IV DD.

Limitations:

This study has several limitations. It was a single-center cross-sectional study with a relatively small sample size, limiting the generalizability and ability to establish causality. Additionally, the lack of a control group and potential unmeasured confounders may have influenced the findings.

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