ASSESSMENT OF DIASTOLIC FUNCTION IN PATIENTS WITH DIABETIC NEUROPATHY

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ABSTRACT

"Diastolic dysfunction" is thought to be an indication of "diabetic cardiomyopathy" ", and "diabetic cardiovascular autonomic neuropathy" is linked to increased mortality risk. The goal of this study was to see how "diastolic dysfunction" and "cardiovascular autonomic neuropathy" are linked both of which were diagnosed in accordance with the guidelines.

Methods: We assessed at seventy three participants Whose elective coronary angiography was referred, Diabetes mellitus was present in twenty-six of them, and twenty four of whom had impaired glucose tolerance, the other twenty-three people had normal "glucose tolerance". To identify "cardiovascular autonomic neuropathy", "autonomic function" tests were done, and "tissue Doppler imaging echocardiography" was employed to confirm "diastolic dysfunction".

Results Autonomical cardiovascular neuropathy has been detected with diabetes type 2 diabetes in (28.8%) and with glucose-impaired tolerance in 6 (12.5%) patients. "Diastolic dysfunction" was found in 81 and 33 percent of patients with and without "cardiovascular autonomic neuropathy", respectively (P <0.001). "Early diastolic relaxation velocity" (Em) was considerably less in comparison to the group without cardiovascular autonomic neuropathy. ("5.4 0.9 vs. 7.3 2.1 cm∕s;P; P 0.001"), Moreover, the E∕Em ratio was much higher. ("13.6 4.6 vs. 10.3 3.4 cm∕s;P, 0.001"). The significance of these data remained after controlling for "age, gender, coronary artery disease, hypertension, and HbA1c". In individuals with and without "cardiovascular autonomic neuropathy", significant "diastolic dysfunction" was found in 33 and 15% of patients, accordingly (P = 0.001).

Keywords "autonomic neuropathy", "diastolic dysfunction", "echocardiography"," diabetes mellitus".

INTRODUCTION

"Diabetes mellitus (DM)" is getting more widespread throughout the world and is soon approaching epidemic numbers. Over the last 30 years, many "epidemiological", "clinical", and "autopsy researches" have raised attention to the fact that "diabetes heart disease" is a distinguishable clinical entity. With "preserved left ventricular systolic function", "diastolic heart failure (HF)" is also known as "HF". Many research investigations have shown that even without hypertension and "coronary artery disease" the incidence of heart failure is significant in diabetics. "Pre-clinical diastolic dysfunction" has been found to be common in individuals with Diabetes mellitus, according to researches. Myocardial harm impacts diastolic function before systolic function in diabetics, according to the facts. The cause of diabetic patients' left ventricular (LV) dysfunction is unknown. Many processes, including "microvascular illness, autonomic dysfunction, metabolic abnormalities, and interstitial fibrosis", have been hypothesized as factors that cause for "diabetic cardiomyopathy", which has been described as a separate "cardiovascular disease".[2] However. The specific cause of diabetic cardiomyopathy is uncertain. There have been couple population-based studies in India

demonstrating the frequency of "diastolic dysfunction" in diabetics. Our research aimed to investigate if "diastolic disease" and "type 2 diabetes" are linked, including in "asymptomatic" patients. Thus, in order to identify the frequency of "asymptomatic diastolic LV dysfunction" in type 2 individuals, The purpose of this prospective case-control study is to determine its relationship to ("age, duration of DM, HbA1, obesity"), and other difficulties, also including "microangiopathy".

PATIENTS AND METHODS

Study population

This research comprised hospitalized patients who were sent to "coronary angiography" for "coronary artery disease" that was either stable or suspected. After the procedure was approved by the local ethics commission, all participants signed informed consent forms.

Scheduled coronary angiography and a range of ages of 18 to 80 years were used as inclusion criteria. "Hypertrophic cardiomyopathy", moderate-to-severe "valvular disease", "uncontrolled hypertension", "atrial fibrillation" or other "severe arrhythmias", "proliferative diabetic retinopathy", "alcoholism", or "blood creatinine" > 191 lmol∕l were all exclusion criteria. A standardized "oral glucose tolerance" test (75 g glucose) was done in individuals without DM according to the World Health Organization's Protocol, as earlier explained. Weight (kg) height (m) was used to determine BMI (m2), (kg)∕height (m2). At the level of the umbilicus, the abdominal girth was measured.

Echocardiography

A standard system was used to do echocardiography in order to diagnose diastolic dysfunction. pw-Doppler r was used to determine conventional transmitral flow. The ratio" (E A) and the early (E) and late (A)"atrial transmitral peak flow velocities" were calculated. "Tissue with a pulse-wave pattern Doppler imaging" was used to examine the "junction of the left ventricular wall and the septal mitral annulus". The "early diastolic velocity" (Em) was observed. The "E∕Em ratio"was measured. Based on a consensus declaration published by the European Society of Cardiology, reduced "early diastolic tissue velocity ("Em") and the "E∕Em ratio" were utilized to characterize diastolic dysfunction. an inverse "E∕A ratio 0.8–1.5" (> 60 years) or < 0.5 (< 60 years) with an "E∕Em ratio" > 15 or E∕A> 1.5) with "Em velocity" < 8 cm∕s "septal mitral annulus".was defined as Severe diastolic dysfunction (pseudo normal pattern)
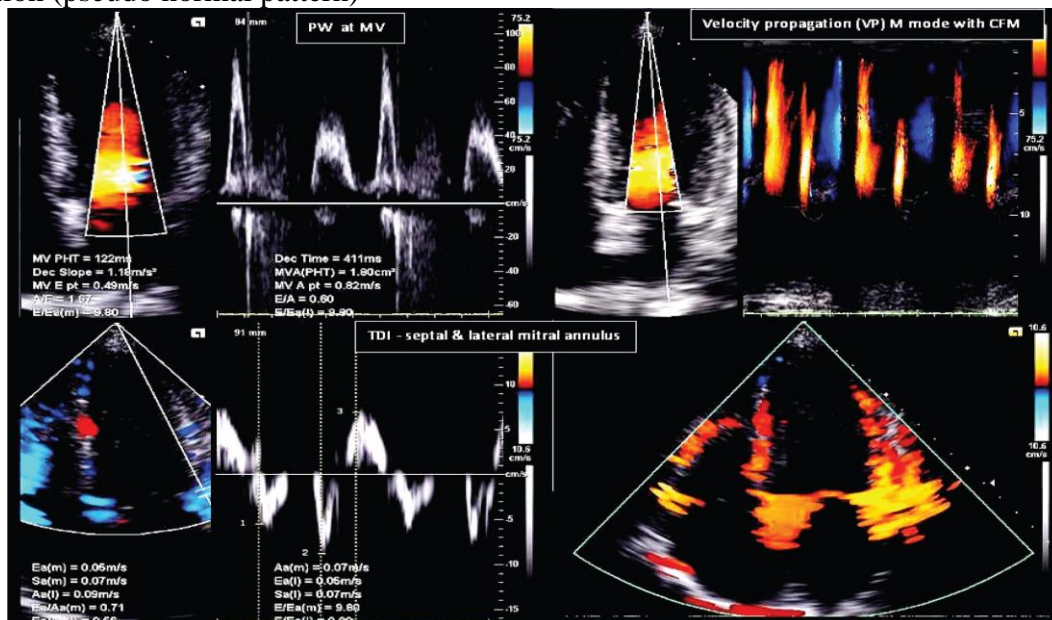
Figure 1: "A two-dimensional transthoracic echocardiographic evaluation" of "diastolic dysfunction" utilizes "pulse wave Doppler (PW)" at the "mitral valve", "velocity propagation" (VP) via "color 'M' mode", and "tissue Doppler imaging (TDI)" at the "septal and lateral mitral annuli".

Autonomic function tests

The German Diabetes Association's standards were used to measure autonomic nerve function in all of the study's participants. The "Varia Cardio TF4-System" (Leeds, UK-based Advantaged Medical Diagnostics) measured "heart rate variability" in the time and frequency domains, as well as "spectral analysis" using "Fourier transformation". As previously indicated, the following factors were incorporated in the concept of "cardiovascular autonomic neuropathy":

- "Coefficient of variation of R-R intervals at rest";
- "Spectral power in the very low-frequency band";
- "Spectral power in the low-frequency band";
- "Coefficient of variation during deep breathing";
- "maximum∕minimum 30:15 ratio";
- "(vi) Valsalva ratio";
- "Postural change in systolic blood pressure".

The occurrence of marginal situations (incipient)"cardiovascular autonomic neuropathy" was considered if 2 of the above tests were abnormal. If at least three abnormal findings were present, definitive "cardiovascular autonomic neuropathy" was considered. In a prior study of validity, these definitions were found to have appropriate diagnostic specificity for "cardiovascular autonomic neuropathy", therefore both groups were recognized to have it. As before published by Agelink et al., standard ranges were used.

Analyses of the lab

If the "diastolic dysfunction" categorization based on "echocardiography" was borderline, "N-terminal (NT)-proBNP" plasma levels were tested as needed for diastolic dysfunction diagnosis using an immunoassay that is commercially accessible (Roche Diagnostic GmbH, Mannheim, Germany). "Glucose", "HbA1c", "total cholesterol", "HDL cholesterol", and "triglycerides" were all measured in the blood."Interleukin-6" An enzyme-linked immunoassay with great sensitivity was also used to evaluate it.

RESULTS

Table 1 In "Type 2 diabetes" or sufferers with "impaired glucose tolerance" with (CAN+), demographics, clinical variables, and laboratory variables and without "CAN (CAN—))" and participants with normal "glucose tolerance without CAN"

	CAN—	CAN—	CAN—	P-value CAN— vs. CAN+	P-value CAN— vs. NGT	P-value CAN+ vs. NGT
Family history of CAD (%)	45	38	36	0.89	0.56	0.95
History of aortocoronary bypass (%)	7	22	3	0.06	0.4	0.03
Previous MI (%)	37	41	35	0.43	0.4	0.31
Previous angioplasty (%)	46	42	25	0.58	0.02	0..08
LVDD (ESC) (%)	34	82	30	< 0.001	0.29	< 0.001
Em (cm/s)	7.3 ± 2.1	5.4 ± 0.9	7.5 ± 2.1	< 0.001	0.47	< 0.001
Interventricular septum (mm)	11.9 ± 2.8	12.3 ± 2.9	11.6 ±2.7	0.629	0.444	0.443
Posterolateral wall (mm)	9.9 ± 2.2	10.7 ± 1.6	9.8 ± 1.9	0.164	0.773	0.106
NYHA	1.4 ± 0.7	1.9 ± 1.1	1.5 ± 0.8	0.025	0.45	0.16
EF (%)	66 ± 15	67 ±17	69 ± 15	0.51	0.78	0.45
NT-pro-BNP (pmol/l)	277 ± 408	552 ±698	201 ± 122	0.24	0.51	0.2
CAD (stenosis > 50%) (%)	35	43	28	0.13	0.07	0.015
1-vessel disease (%)	16	12	12	0.22	0.12	0.97
2-vessel disease (%)	8	19	5	0.1	0.08	0.002
3-vessel disease (%)	11	12	11	0.9	0.23	0.93

The mean standard deviation (SD) is used to express the data. or as a percentage
"ACE, angiotensin-converting enzyme"; "ASS, acetylsalicylic acid"; "BP, blood pressure"; "CAN, cardiovascular autonomic neuropathy"; "DM,
diabetes mellitus"; "IGT, impaired glucose tolerance"; "IL-6, interleukin 6", "MAD, mean arterial pressure"; "NGT: normal glucose tolerance"; "PAD,
peripheral arterial disease". "Significant difference = P < 0.05 (bold type)".

Table 2 Cardiovascular evaluation variables in "Type 2 diabetes" or participants with "impaired glucose tolerance" with "(CAN+)" and without "(CAN)" and in participants with "normal glucose tolerance without CAN".

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Table 3: The research looked at the relationship between diastolic dysfunction and a sufferers with "type 2 diabetes" have a wide range of dependant variables.

Variables	Diastolic dysfunction present	Diastolic dysfunction absent	Total (%)	'P' value
Age < 45 years (n = 23)	10 (43.47)	13	18.11	< 0.05
Age > 45 years (n = 104)	61 (58.65)	43	81.88	< 0.05
Retinopathy present (n = 27)	24 (88.88)	3	21.25	< 0.002
Autonomic neuropathy (postural hypotension) (n = 32)	27 (84.37)	5	25.19	< 0.001

DISCUSSION

"Diastolic dysfunction" is common among sufferers with "T2dm" and "impaired glucose tolerance" who are forwarded for an "elective coronary angiography", according to the findings of, this research. Furthermore, these patients have "diastolic dysfunction" and even mild "cardiovascular autonomic neuropathy", regardless of glycemic management, "coronary artery disease, age, gender, hypertension, or ejection fraction". Only 33percent of patients without "cardiovascular autonomic neuropathy" had exhibited "diastolic dysfunction", compared to 81 percent of those with "diabetes" or "impaired glucose tolerance" who had proof of "cardiovascular autonomic neuropathy". As a result, the existence of "cardiovascular autonomic neuropathy" appears to have an additive effect on "diastolic dysfunction in Type 2 diabetes" when combined with "coronary artery disease". These findings corroborate a small amount of researchs that looked at the link between "cardiovascular autonomic neuropathy" and "diastolic dysfunction", mostly in "Type 1 diabetic patients". Nonetheless, several doubts have been raised about the methodological challenges surrounding the recognition and recruiting of "diastolic dysfunction" in prior researches' participants. The diagnostic considerations for "diastolic dysfunction" were strongly varied and did not take into account the diagnostic standards. In addition, the majority of these studies did not use coronary angiography to check for the existence of "coronary artery disease". Because it has been linked to both "cardiovascular autonomic neuropathy" and "left ventricular diastolic dysfunction", the inadequacy of data on "coronary morphology" could lead to an overestimation in patients with "cardiovascular autonomic neuropathy," the frequency and intensity of "diastolic dysfunction" compared to those without. Furthermore, past research did not use an "oral glucose tolerance test" to screen participants for undiagnosed "pre-diabetes". On the other hand, the existing research adopted standard recommendations for diagnosing "diastolic dysfunction" and "cardiovascular autonomic neuropathy" in participants who were well- categorized for plasma glucose levels and coronary morphological abnormalities. Decreased "Em velocity" was an individual indicator of "cardiac fatality" in a research by Wang et al., which included over 500 participants with cardiac diseases and controls. Intriguingly, patients with "Type 2 diabetes" or "impaired glucose tolerance" who developed "cardiovascular autonomic neuropathy" had a considerably lower "Em velocity" than those who did not develop cardiovascular autonomic neuropathy, according to our findings. Furthermore, these individuals had a higher grade of diastolic dysfunction (pseudo normal pattern), a diastolic dysfunction characteristic that predicts recurrent symptomatic heart failure. they discovered a link between diabetes duration and "left ventricular diastolic dysfunction", as well as a link between increased "E/Em ratio" and all-cause death in individuals with "diabetes" by et al. "Diastolic dysfunction" was related with a 4-year

duration of diabetes, and alone of "hypertension" and "coronary artery disease", "diastolic dysfunction" was found to be a predictor of all-cause death. in that research. even in the subpopulation with normal "conventional echocardiography", Tissue Doppler imaging-detected "diastolic dysfunction" was a strong and significant predictor of fatality in the populace in general, which it is largely devoid of "left ventricular systolic dysfunction", according to Mogelvang et al. lately demonstrated. Previous research has demonstrated that all-cause mortality is increased in individuals with "diabetes" and "cardiovascular autonomic neuropathy", just as it is in subjects with lower "Em velocity and E/Em ratio". In diabetics, "cardiovascular autonomic neuropathy" has been identified to be an significant risk element for the occurrence and severity of "diastolic dysfunction", according to our findings. Furthermore, Due to a combination of "cardiovascular independent neuropathy" with "diastolic dysfunction" after adjustment to the "age, sex, diabetes, coronary artery, BMI, hypertension, HbA1c and ejection fraction", it is likely that "diastolic dysfunction" can be, at least in part, attributed to "cardiovascular autonomic neuropathy", or the complication of it. Which could be the cause of "cardiovascular autonomic neuropathy's" additive impact on "diastolic dysfunction". Vagal insufficiency, which increases the "renin–angiotensin–aldosterone system" and rises "heart rate" and "peripheral vascular tone", might result in a "relative predominance of sympathetic activity". Furthermore, Impaired myocardial regulating blood flow is linked to the occurrence of "cardiovascular autonomic neuropathy". "Endothelial dysfunction", "microangiopathy", and "cardiovascular autonomic neuropathy" may all contribute to a reduction in "vasomotor tone", resulting in a decrease in "myocardial blood flow" and regulation. In additionally, those with cardiovascular autonomic neuropathy, the circadian fluctuation in blood pressure is reduced, with greater nighttime concentrations, this may be accountable for the advancement of "structural myocardial alterations" and "functional" diastolic problems" by contributing to increased "left ventricular afterload". What might be clinical effects our research 's findings have? After "new onset of diabetes", the occurrence of "heart failure" is relatively high, with 6percent of participants getting heart failure within five years, begging the issue of how persons with "diabetes" at high risk of "heart failure" might be recognized. As a result, the combination of "diastolic dysfunction" and "cardiovascular autonomic neuropathy", we believe, may be a warning sign for progression of "diabetic cardiomyopathy" and "heart failure". "Diastolic dysfunction" is common in diabetics, notably in people who have recently been confirmed with diabetes, despite the fact that "Diabetic cardiomyopathy's" cause and pathogenesis are unknown and multi - factorial. Fifty percent of diabetics had "diastolic dysfunction" on "echocardiography", compared to twenty seven percent of those without diabetes, according to the Olmsted County research. There was almost no history of heart failure among these patients. In addition, the Olmsted County researchers reported that even mildly "impaired diastolic function" is connected to an eightfold increased risk of death from any cause when contrasted to typical diastolic function. In a research by Redfield et al., the effect of "diastolic dysfunction" on fatality was once again demonstrated. When compared to normal diastolic function, even minor diastolic dysfunction resulted in a "hazard ratio of 8.31" for mortality. The frequency and intensity of "diastolic dysfunction" were linked to the degree of glucose metabolism impairment across the entire metabolic spectrum, including impaired glucose tolerance, according to a Stahrenberg et al. published a recent research. The frequency of "diastolic dysfunction" was higher in those with cardiovascular autonomic neuropathy, confirming existing findings and extending this discovery. Accordingly, in participants with "impaired glucose tolerance", we speculated that "cardiovascular autonomic neuropathy" and "left ventricular diastolic dysfunction" may play a role

in increased "cardiovascular risk". Our findings are also consistent with epidemiological evidence demonstrating that participants with "impaired glucose tolerance", but not "isolated impaired fasting glucose", have altered "cardiac autonomic function". As a result, approaches for early recognition and management in those who are at a substantial chance of acquiring "diabetic cardiomyopathy" must be developed.

CONCLUSION

"Cardiovascular autonomic neuropathy" is connected to a Substantial occurrence and greater serious type of "left ventricular diastolic dysfunction" in individuals with "diabetes" or "impaired glucose tolerance" who undergo "coronary angiography". Patients with "diastolic dysfunction" and "cardiovascular autonomic neuropathy" who also have "diabetes" or "impaired glucose tolerance" may be identified as being at higher risk because both "cardiovascular autonomic neuropathy" and "diastolic dysfunction" are linked to a greater hazard of "cardiovascular morbidity" and mortality.

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