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ORIGINAL ARTICLE

Relationship among Serum Hydrocortisone and Impairment in Left Ventricle Diastolic Function with Subjects of Diabetes Mellitus

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ABSTRACT

Background: Diabetes mellitus (DM) is considered main dangerous feature for the expansion of cardiac metabolic and coronary disorders. Chronic Heart failure along conserved ejection fraction (EF %) were distinguished by the dysfunction of left ventricle diastolic phase (LVDD).
Aim: Aim of subjects with elevated serum cortisol or hydrocortisone level establish with Cushing's syndrome has to be related with the progression of the LVDD.
Methodology: We select 42 patients Diagnosed with (DM) and 40 subjects with no DM. Which was underwent echocardiography assessment at multiple hospitals of Lahore within two years of duration. The functions of left ventricle were estimate and the percentage of before time diastolic rate from inflow to trans-mitral before time diastolic rate be considered while guide for diastolic purpose. Concentration of serum cortisol in Plasma, glucose levels, serum fasting cholesterol and triglyceride levels, along by means of anti glycemic medications plus additional scientific distinctiveness was estimated, as well as along its relationship among E/A was resolute by means of only one variable and multiple variable analysis.
Results: Multiple variable linear regression study illustrate that log of E/A were confidently associated by age factor (P=0.018), blood pressure systolic phase (P=0.003) and hydrocortisone (P=0.037), in subjects of diabetes mellitus. Multiple variable analysis illustrate that hydrocortisone were completely associated by means of age (P=0.016) and glycated hemoglobin (P=0.011). Therefore no relationship found among E/A and serum hydrocortisone levels in control subjects.
Conclusion: Raised levels of hydrocortisone concentration might elevate the possibility of rising in subjects of diabetes mellitus.
Keywords: Diabetes mellitus, left ventricle diastolic function, serum hydrocortisone

INTRODUCTION

The most important consequence for the progression of coronary vascular disorder is Diabetes mellitus (DM). Cardiac failure with conserved (EF%), which is differentiate by dysfunction of left ventricle diastolic phase (LVDD) is clinically significant in subjects by means of DM[1]. The frequency of Diabetes is around 42% in subjects through cardiac failure with preserved EF%. It is essential to assess (LVDD), independently from LV systolic function as subjects with normal LV wall contraction may have warning sign of cardiac failure[2]. Tissue Doppler imaging publicized to be an outstanding interpreter for LVDD. Cushing's syndrome and disease is characterize by increase serum cortisol levels, and awards an around fivefold enhancement in mortality evaluate with the common populace due to the reason of cardiac consequences. The subjects with Cushing's syndrome (CS) having a higher prevalence of LV enlargement and abnormal function[3]. Therefore probably the hydrocortisone influence on heart composition and function, even though its association with subjects of LVDD with DM has not been concentrate on.

We planned a quantitative cross-sectional study for establishing the association among hydrocortisone and LVDD in subjects of DM which do not contain obvious cardiac and vascular disorders[4].

METHODOLOGY

After IRB permission, we successively recruit 20 subjects of DM plus 20 subjects with no DM who have gone through echocardiography (ECHO) assessment at multiple hospitals in Lahore. Exclusion criteria for subjects if they were taking steroids, taking haemodialysis management, chronic cardiac failure; acute disorder, as ACS acute coronary syndromes and cerebro-vascular disorder; and diabetic keto-acidosis. The diabetic group was selected in which subject who was hospitalized meant for blood glucose management. Subjects with no diabetes consist in which they were admitted for arterial hypertension (HTN), GIT mass and non-functional adrenal gland overgrowth. All the subjects undergo clinical assessment, lab investigations and ECHO. Within diabetic group its nature, occurrence of vascular disease and HTN, history of IHD. Serum glucose fasting levels, glycated hemoglobin (HbA1c), Adrenal hormone cortisol after 8 hours of fasting were calculated. Serum hydrocortisone levels are estimated by an immune-assay (CLIA). A level of HbA1c was decided by applying the criterion of the National Glyco-hemoglobin Standardization Programs. Heart chambers proportion plus left ventricle EF% was estimated in accord by means of reference of American Society of Echo-cardiography. The waves E and A, Peak velocities of inflow through mitral valve, the E/A proportion by using Doppler imaging Statistical analysis were carried out using SPSS version 27.0. For univariate analysis continuous and categorical variables were analyze by means of Spearman's rank-order relationship plus Mann Whitney U-test, correspondingly. The univariate representation of variables was going through in multiple variable linear regression analysis. Categorical variables are offered as number(%) or median (upper/lower quartile range). The P-value<0.05 was consider significant in statistical analysis.

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RESULTS

The physical and chemical variables of this study subjects is revealed in Table 1 in which diabetic group was elder in comparison of non-diabetic crowd, and not found any important disparity in genders among the two groups. Serum glucose Fasting levels, HbA1c, systolic blood pressure (SBP) and serum hydrocortisone levels was found appreciably raised, In the diabetes group, 16 (80%) having HTN and 12(60%) having the past history of ischemic diseases of heart. The ECHO statistics is revealed in Table 2. The EF% of left ventricle was conserved in equally the diabetics and non-diabetic subjects (68%, inter-quartile range (IQR) 63–74%. For the reason that the E/e'ratio and serum hydrocortisone levels was raised in the diabetic in comparison to non-diabetic groups, together we assess the associations amid the E/e'ratio and additional physical parameters, counting lab variables serum hydrocortisone. During this investigation, age is (P<0.001), time length of diabetes (P=0.039), SBP (P<0.001) and serum hydrocortisone (P= 0.008) were completely linked with the E/e'ratio. There were no relationship among HbA1c and the E/e'ratio. The features were related by means of E/e'ratio in the univariate analysis and are incorporated with multiple variable linear regression models. The E/e' proportion were completely associated with age factor (P= 0.015) and the SBP (P= 0.003) and serum hydrocortisone (P= 0.038).We analyze the causes who were related with serum

hydrocortisone levels in a diabetes condition[5]. The Uni-variate study illustrate with the aim of age is (P=0.022), serum blood glucose in fasting (P=0.004), HbA1c (P=0.007), In adding together, the incidence of co morbidities plus the kind of anti HTN therapy was examine as multiple factors complicated in raising serum hydrocortisone concentrations of the diabetic subjects, in addition to no considerable relationship were establish. These findings recommend that high serum hydrocortisone levels in a blood are connected by LV malfunction in subjects of DM. In distinction, there were no association among E/e' and serum hydrocortisone in subjects with no DM subjects\ LAVI, is considered as marker of LVDD, and was calculated in 20 subjects in the diabetic group and 20 subjects in diabetes free group. Presently in this research there were no considerable connection among blood hydrocortisone and LAVI in any of diabetic group (P= 0.322) or the non-diabetic group (P= 0.238).

Table 1: Patients Physical and laboratory characteristics in control and diabetic group

Patients characteristics	**Control (n= 20)**	**DM (n=20)**	**P -value**
Age in yrs	50 (52–62)	65 (55–70)	<0.001
Gender, M/F (%)	8 (40.0)/ 12(60.0)	12(60)/8 (40)	0.836
BMI (kg/m2)	23.5(21.3–26.1)	25.7 (21.4–29.8)	0.147
Duration of diabetes (years)		6 (5–19)	0.039
SBP (mmHg)	120 (112–128)	128 (113–145)	<0.001
DBP (mmHg)	70 (68–79)	75 (69–90)	0.107
Fasting blood glucose (mg/dL)	89 (84–96)	143 (118–185)	<0.001
HbA1c (%)	5.5 (5.4–5.7)	8.9 (7.7–10.2)	<0.001
Cortisol (lg/dL)	9.30 (7.4–14.0)	12.6 (10.0–15.5)	0.008
Glucose lowering therapies			
Oral hypoglycemic		18 (16)	
Insulin		14 (12)	

Table 2: Echo cardiac Results of control and diabetic group

Echo cardiac Results	**Control (n= 20)**	**DM (n= 20)**	**P-value**
Left atrial dimension (mm)	33 (30–37)	35 (30–40)	0.023
Left ventricular end-diastolic dimension (mm)	46 (43–49)	45 (42–49)	0.636
Left ventricular end-systolic dimension (mm)	28 (25–30)	28 (25–31)	0.690
Interventricular septal wall dimension (mm)	8 (7–10)	9 (8–11)	<0.001
Posterior wall thickness dimension (mm)	9 (8–10)	9 (9–10)	<0.001
Left ventricular ejection fraction (%)	70 (66–73)	68 (63–74)	0.141
Left atrial volume index			0.322
E wave(cm/s)	67(57–77)	65 (54–79)	0.657
A wave(cm/s)	63(54–80)	78 (64–92)	<0.001
E/A	1.0 (0.8–1.3)	0.8 (0.6–1.0)	<0.001
Total subjects=40. Definite variables are presented as number (%) or median			

DISCUSSION

In our line of work current study shows a noteworthy relationship among E/e'ratio, serum hydrocortisone, age, and systolic BP, in subjects with diabetes. It is reported that the E/e'ratio is connected with calculated LV filling pressure. As a result, the E/e'ratio may provide as a substitute assess for LV function during diastole. The important conclusion for current research that serum hydrocortisone levels were appreciably elevated with in diabetic group as comparison with diabetic free group, and serum hydrocortisone levels were separately and completely linked by means of the E/e'ratio in subjects having diabetes. Therefore no considerable association found among E/e', serum hydrocortisone in non diabetic subjects. It is believable that pathological rise in serum hydrocortisone, as case that initiate in CS, and milder elevate serum hydrocortisone institute in diabetics act as significant function in the progression of dilated cardiomyopathy[6].

Expressions of Glucocorticoid receptors are rich in the heart. Consequently, serum hydrocortisone may contain straight effect at myocardium tissue. Furthermore, the mineralo-corticoids receptor (MR) has far above the ground attraction for both mineralo-corticoids and Glucocorticoid[6]. As glucocorticoids classically flows at levels hundred-folds more than mineralo-corticoids, the MR is likely to be essentially engaged by glucocorticoids.The cortisol is in activated by enzyme 11beta-hydroxysteroid dehydrogenase type 2, who provides protection to binding with MR with Glucocorticoid on targeted tissues[7].

In contrasting the heart has no considerable dehydrogenase activity and in response glucocorticoids can freely to activate the MR and in consequences that commencement for the MR provokes changes in ventricle, increase in mass and degenerative changes in the cardiac chambers. Additionally, elevated levels of serum glucose excite signaling activity of protein kinase C beta, leading to stabilization of MR and starting of its transcriptional signaling[8]. Collectively, serum hydrocortisone may be implicated for expansion of diastolic malfunctioning all the way through commencement of MR in subjects of DM. TH current study, multivariate linear regression analysis illustrate that cortisol was confidently linked with HbA1c and age in DM group. Patients with uncontrolled DM and along with ageing, diabetes have elevated cortisol levels, which might leads in progression for LV diastolic malfunctioning.

CONCLUSIONS

Raised levels of serum hydrocortisone levels may elevate the possibility of rising LV diastolic malfunctioning in subjects of DM. In Future further research studies force is essential for confirming the associations that were experimental in this current study. The present research is only the primary revelation of a helpful relationship among serum hydrocortisone and LV diastolic malfunctioning in diabetic subjects. The current study makes easy and better perceptive of the pathological aspect of LVDD, and might offer a means for forecast the advancement of LVDD in subjects with diagnosed DM.

Conflict of interest: Nil

REFERENCES

1. Gaasch, W.H. and M.R. Zile, *Left ventricular diastolic dysfunction and diastolic heart failure.* Annu. Rev. Med., 2004. **55**: p. 373-394.
2. Kannel, W.B., K. Ho, and T. Thom, *Changing epidemiological features of cardiac failure.* British heart journal, 1994. **72**(2 Suppl): p. S3.
3. Knowlton, A.I. and L. Baer, *Cardiac failure in Addison's disease.* The American journal of medicine, 1983. **74**(5): p. 829-836.
4. Yamaji, M., et al., *Serum cortisol as a useful predictor of cardiac events in patients with chronic heart failure: the impact of oxidative stress.* Circulation: Heart Failure, 2009. **2**(6): p. 608-615.
5. Radahmadi, M., et al., *Effects of stress on exacerbation of diabetes mellitus, serum glucose and cortisol levels and body weight in rats.* Pathophysiology, 2006. **13**(1): p. 51-55.
6. Dourado, M.L.B.F., et al., *Dilated Cardiomyopathy Reversibility in Sheehan's Syndrome: A Case Report.* Arquivos Brasileiros de Cardiologia, 2021. **116**: p. 17-20.
7. Elhalawany, S.H., et al., *Association of 11beta-hydroxysteroid dehydrogenase type 1 (HSD11B1) gene polymorphism with Type 2 Diabetes Mellitus in a sample Egyptian Population.* The Egyptian Journal of Hospital Medicine, 2021. **83**(1): p. 1050-1055.
8. Jang, I., et al., *Clinical and Molecular Characteristics of PRKACA L206R Mutant Cortisol-Producing Adenomas in Korean Patients.* Endocrinology and Metabolism, 2021. **36**(6): p. 1287.