Journal of Cardiovascular Disease Research

ISSN: 0975-3583, 0976-2833 **VOL14, ISSUE 04, 2023**

ORIGINAL ARTICLE RESEARCH

Association of Cortisol Level and Prevalence of Coronary Artery Disease in patients with type 2 Diabetes Mellitus

Gandhi Parise[1], Harinath Tarigopula[2], Fahima Begam[3], Yarram Raghava Reddy[4*]

[1,2,3,4]Assistant Professor, Department of General Medicine, Guntur Medical College, Guntur, India.

***Corresponding Author: Dr. Yarram Raghava Reddy,** Assistant Professor, Department of General Medicine, Guntur Medical College, Guntur, India.

Received: 29 March 2023 **Revised:** 15 April 2023 **Accepted:** 28 April 2023

ABSTRACT

Background: Type 2 diabetes is the predominant form of diabetes worldwide, accounting for 90% of cases globally. Increased activity of hypothalmopituitary axis and elevated cortisol level may underlie metabolic syndrome and coronary artery disease in patients with Type 2DM. **Aim and Objectives:** To know association of serum cortisol level and prevalence of CAD among type 2 diabetes mellitus thus we have tried to find serum cortisol level and prevalence of CAD among type 2 diabetes patients in this study.

Methods: This is a cross-sectional study conducted in, department of General Medicine, Guntur Medical College, Guntur, included 100 patients attending with type 2 diabetes mellitus, after following inclusion and exclusion criteria and approved by institutional ethical committee.

Results: In our study total 120 patients were included after following inclusion and exclusion criterial, Out of patients was studied 44% were females and 56% were males. 50% was in the age group of 50- 60 years, 42% was in between 61-70% and only 8% patients contributes > 70 years. 54.17% was without coronary artery disease and 45.83% patients was associated with CAD. 24 showed elevated fasting cortisol level and rest were normal. Out of 120 patients studied, 55 had coronary artery disease. Among 24 patients with elevated cortisol, 19 were associated with coronary artery disease and association between serum cortisol level and coronary artery disease was statistically highly significant.

Conclusion: There is an association of elevated cortisol and high prevalence of coronary artery disease in patients with type 2 DM. Also we have observed that, there was hyperactivity of hypothalamopituitary axis in type 2 DM patients.

Keywords: Type 2 diabetes, Serum Cortisol, hypothalamopituitary etc

INTRODUCTION

Type 2 diabetes is the predominant form of diabetes worldwide, accounting for 90% of cases globally. An epidemic of Type 2 diabetes is underway in both developed and developing countries. Globally the number of Type 2 DM is expected to rise from the current estimate of 150 to million in 2010 and 300 million in 2025. So Type 2 DM has become one of the world's most important public health problems Patients with diabetes have 2- to 4-fold greater risk of developing CAD than non-diabetic patients.[1,2] Additionally, 75% of T2DM patients die as a consequence of cardiovascular diseases, including CAD.[2] In patients with T2DM, CAD tends to

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 04, 2023

be a more complex disease characterized by small, diffuse, calcified, multivessel involvement [multivessel disease (MVD)][3,4]

Cortisol, also known as the stress hormone, is released as a body response to combat physical and psychological stress. Cortisol is a steroid hormone synthesized in a multi¬stage process from cholesterol in the zona fasciculata of the adrenal gland. The primary function of cortisol is increasing the blood glucose levels through gluconeogenesis.[5] The secretory rates of serum levels of cortisol are high in the morning but low in the late evening. The plasma cortisol level ranges between 5 μg/dl around midnight and 23 μg/dl in the morning.[5] Increased activity of hypothalmopituitary axis and elevated cortisol level may underlie metabolic syndrome and coronary artery disease in patients with Type 2DM. People with Type 2DM are at increased risk of cardiovascular disease risk and hyperactive hypothalmopituitary axis thus suitable for study of association of cortisol level with cardiovascular risk.[6] There are very less studies to know association of serum cortisol level and prevalence of CAD among type 2 diabetes mellitus thus we have tried to find serum cortisol level and prevalence of CAD among type 2 diabetes patients in this study.

MATERIALS AND METHODS

Study Design: A Cross Sectional Study

Study Place: Department of General Medicine, Guntur Medical College, Guntur

Study Duration: For the period of One Year

Study Population: Patients attending with type 2 diabetes mellitus

Study Sample: 120 Patients selected using simple random sampling during study period.

Inclusion Criteria

1. Type 2 DM Patients
2. Age group above 50 years
3. Both Sexes
4. First Admission

Exclusion Criteria

1. Cushing disease / Syndrome
2. Patients who are on steroid treatment
3. Age group below 50 years

Methodology

In those patients BP, Waist Circumference, Blood Glucose Levels, Lipid profile, fasting cortisol level and Urine Protein were measured and ECG, Echocardiogram was taken to study whether there is an increased association of cortisol level with prevalence of coronary artery disease in patients with Type 2DM.

Diagnosis of Diabetes Mellitus

1. Random Blood Glucose Concentration more than 200 mg %(>11.1mmol/L)
2. Fasting Glucose more than 126 mg % (>7mmol/L)
3. Two hour plasma glucose more than 200 mg %(>11.1mmol/L) during an oral GTT.

Diagnosis of Coronary Artery Disease

1. Symptoms Like angina and anginal equivalents.
2. ECG
3. ECHO

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 04, 2023

Cortisol Measurement

- Fasting cortisol level was measured after 8-10hours of fasting.
- Normal fasting cortisol – 5-25 microgram/dl

Statistical Analysis: Collected data were collected in Microsoft Excel 2016, for further statistical analysis. Categorical data were expressed in the form of frequency and percentage while quantitative data was expressed in the form of mean and standard deviation. Association between the variables were assessed by using chi-square test. P-value<0.05 were considered as statistically significant. Statistical Software SPSS version 25 was used to perform statistical analysis.

RESULTS

In our study total 120 patients were included after following inclusion and exclusion criterial, Out of patients was studied 44% were females and 56% were males. 50% was in the age group of 50- 60 years, 42% was in between 61-70% and only 8% patients contributes > 70 years. 54.17% was without coronary artery disease and 45.83% patients was associated with CAD. 24 showed elevated fasting cortisol level and rest were normal shown in table 1.

Table 1: Distribution of Demographic variable among study population

Parameters	Frequency	Percentage
Gender		
Male	63	53
Female	57	47
Age in intervals		
50-60 Years	60	50
61-70 Years	50	42
>70 Years	10	8
Coronary artery Disease		
No	65	54.17
Yes	55	45.83
Cortisol Level		
Elevated	24	20
Normal	96	80

Table 2: Association between serum cortisol level and age.

Age	Serum Cortisol		Total	Chi-Square	P-value
	Normal	Elevated			
50-60 Years	50(83.33%)	10(16.67%)	60(100%)	0.91	0.338
61-70 Years	38(76%)	12(24%)	50(100%)		
>70 Years	7(70%)	3(30%)	10(100%)		

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 04, 2023

Table 3: Association between serum cortisol level and age.

Fasting Cortisol	CAD		Total	Chi-Square	P-value
	Present	Absent			
Normal	36(37.5%)	60(62.5%)	96(100%)	13.42	<0.001
Elevated	19(79.16%)	5(20.84%)	24(100%)		
Total	55(45.83%)	65(54.17%)	120(100%)		

Above table showed association between cortisol level and coronary artery disease, out of 120 patients studied, 24 patients showed elevated cortisol, 96 patients had normal cortisol level. Out of 120 patients studied, 55 had coronary artery disease. Among 24 patients with elevated cortisol, 19 were associated with coronary artery disease and association between serum cortisol level and coronary artery disease was statistically highly significant. It means that in patients with elevated fasting cortisol level, there is an increased chance of coronary artery disease.

DISCUSSION

Coronary and peripheral vascular atherosclerosis is one of the most common and chronic complication of diabetes mellitus. A recently observed and focused aspect of coronary artery disease is its silent and asymptomatic presentation. In this study we aimed to know the prevalence of CAD among type 2 diabetes mellitus and association of serum cortisol level and CAD in type 2 diabetes patients.

In the present study, 63 were males and 57 were females with mean age of 61.2 years with SD of 8.45 years. In our study population, In the present study prevalence of CAD was 45.83%

One study concluded that the prevalence of silent myocardial ischaemia by using exercise ECG was 17% and angiographic coronary artery disease was found in 13% of middle aged subjects with type 2 diabetes mellitus without other cardiovascular risk factors.[7]

The Framingham Heart study revealed a marked increase in congestive heart failure, coronary artery disease and sudden cardiac death in type 2 diabetes mellitus patients(The risk increases from one to five fold in DM).The American Heart association has designated DM as a major risk factor for cardiovascular disease[8]

Conventional risk factors for coronary artery disease are diabetes mellitus, systemic hypertension, dyslipedemia, etc. Diabetes mellitus is the major risk factor for coronary artery disease. Newly proposed theory is that there is an overactivity of hypothalamopituitary adrenal axis and elevated cortisol level.[9]

Elevated cortisol was a single risk factor for coronary artery disease. According to Edinburg type 2 diabetes study, type 2 diabetic patients have hyperactive hypothalamopituitary adrenal axis and have elevated cortisol level and it was concluded that there is an increased chance of metabolic syndrome and coronary artery disease in patients with elevated cortisol level.

Out of 120 diabetic patients, 24 patients had elevated cortisol level 19 out of 24 patients with elevated level had coronary artery disease. This showed that there was an association between elevated cortisol level and coronary artery diseases.[9]

In our population, cortisol was only moderately elevated. Also, cortisol was elevated in patients who were having more than one complication of diabetes like dyslipedemia, central obesity, proteinuria and hypertension. Also, there was an association between elevated cortisol and coronary artery disease.

ISSN: 0975-3583, 0976-2833 VOL14, ISSUE 04, 2023

CONCLUSION

From overall observation and discussion with other studies we can conclude in our study, that out of 120 patients,24 had mild to moderate elevation of fasting serum Cortisol. There is an association of elevated cortisol and high prevalence of coronary artery disease in patients with type 2 DM. Also we have observed that, there was hyperactivity of hypothalamopituitary axis in type 2 DM patients, but we recommend further studies are needed to find out the mechanism of hypothalamopituitary axis overactivity.

Conflict of Interest: None
Acknowledgement: None
Funding: None

REFERENCES

1. Newman AB, Siscovick DS, Manolio TA, Polak J, Fried LP, Borhani NO, et al. Ankle-arm index as a marker of atherosclerosis in the Cardiovascular Health Study. Cardiovascular Heart Study (CHS) Collaborative Research Group. Circulation 1993; 88(3): 837e845.
2. Himmelmann A, Hansson L, Svensson A, Harmsen P, Holmgren C, Svanborg A. Predictors of stroke in the elderly. Acta Med Scand 1988; 224(5): 439e443.
3. Norhammar A, Malmberg K, Diderholm E, Lagerqvist B, Lindahl B, Rydén L, Wallentin L. Diabetes mellitus: the major risk factor in unstable coronary artery disease even after consideration of the extent of coronary artery disease and benefits of revascularization. J Am Coll Cardiol 2004; 43: 585-591 [PMID: 14975468 DOI: 10.1016/j.jacc.2003.08.050]
4. Creager MA, Lüscher TF, Cosentino F, Beckman JA. Diabetes and vascular disease: pathophysiology, clinical consequences, and medical therapy: Part I. Circulation 2003; 108: 1527-1532 [PMID: 14504252 DOI: 10.1161/01.CIR.0000091257.27563.32]
5. Barrett KE, Barman SM, Brooks HL, Yuan JX-J. The Adrenal Medulla & Adrenal Cortex. In: Ganong's Review of Medical Physiology, 26e. New York, NY: McGraw-Hill Education; 2019.
6. Feener EP, King GL. Vascular dysfunction in diabetes mellitus. Lancet. 1997 Jul;350 Suppl 1:SI9-13. doi: 10.1016/s0140-6736(97)90022-2. PMID: 9250277.
7. Fornengo P, Basio A, Epifani G, Pallisco O, Mancuso A, Pascale C. Prevalence of silent myocardial ischaemia in new-onset middleaged Type 2 diabetic patients without other cardiovascular risk factors. Diabet Med 2006; 23(7): 775-9.
8. Harrisons principles of internal medicine; (17th edition) metabolicsyndrome (robert h eikel); ischemic heart disease (riliot m antman, andrew p selwyn, eugene braunwald, joseph loscalzo)
9. Reynolds RM, Labad J, Strachan MW, Braun A, Fowkes FG, Lee AJ, Frier BM, Seckl JR, Walker BR, Price JF; Edinburgh Type 2 Diabetes Study (ET2DS) Investigators. Elevated fasting plasma cortisol is associated with ischemic heart disease and its risk factors in people with type 2 diabetes: the Edinburgh type 2 diabetes study. J Clin Endocrinol Metab. 2010 Apr;95(4):1602-8. doi: 10.1210/jc.2009-2112. Epub 2010 Feb 3. PMID: 20130072; PMCID: PMC3971455.