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Original Research

Biochemistry Section

Hypertension and Dyslipidemia in Type 2 Diabetes Mellitus patients of Guntur and Krishna districts in Andhra Pradesh, India

SIVA PRABODH, DESAI VIDYA SRIPAD, CHOWDARY NVS, RAVI SHEKHAR

ABSTRACT

Introduction: Hypertension (HTN) and Dyslipidemia (DL) when coexist with Diabetes Mellitus(DM), there is an increase in the risk of cardiovascular complications and also contributes to morbidity and mortality. Aim of our study is to find out the percentage of i)dyslipidemics among diabetics and correlation of the lipid profile status with the glycemic control ii) hypertensives among diabetics and correlation of blood pressure with glycemic control.

Methods: 100 patients with Type- 2 DM with 10–15 years of duration, aged between 45- 65 years attending the General Medicine OP in NRI General Hospital, Chinakakani from September to November, 2010 were included in the study. In each patient HbA1C, Total cholesterol, Triglycerides, HDL were estimated. Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) were measured. The results were statistically analyzed by Z-test, p-test and Pearsons correlation tests.

Results: Among 100 Type - 2 DM patients, only 21% were under good glycaemic control, 61% cases had dyslipidemia with higher Total Cholesterol (204± 40.24), higher Triglycerides (166.26± 58.68) and lower HDL-C (39.56±9.09) mg/dl,where p- value 0.001 which is highly significant. HbA1C is having a strong positive correlation with Total Cholesterol and Triglycerides where as a strong negative correlation with HDL which is highly significant. 53% cases had hypertension with SBP (126.2±13.28) and DBP (82.87±7.66) mmHg and the p- value is < 0.0001 which is highly significant. HbA1C is having weak positive correlation with SBP and DBP which is not significant.

Conclusion: Co-morbidity with HTN and DL is found to be high in the patients with Type-2 DM especially among those with poor glycaemic control. The strong association of these suggest that these patients may be at a higher risk of developing cardiovascular diseases. Further studies need to be done with regular patient follow up to find out the percentage of patients developing cardiovascular complications.

Key Words: Hypertension, Dyslipidemia, Type-2 Diabetes Mellitus, SBP, DBP, Total Cholesterol, Triglycerides, and HDL-C

INTRODUCTION

Type-2 diabetes mellitus is a state of insulin resistance, which results in elevated blood glucose levels.This tissue insensitivity to insulin is compensated by pancreas by secreting excessive insulin (hyperinsulinemia) so as to maintain the blood glucose level in normal range.

Insulin resistance has been shown to be an independent risk factor for ischaemic heart disease by its synergistic effects with apolipoprotein B [1]. It also predicts the existence of development of Type-2 diabetes mellitus, altered lipoprotein profile and hypertension [2].

Studies have shown that by various mechanisms like activation of the sympathetic nervous system, increased renal tubular sodium retention, elevated intra-cellular calcium concentration and vascular smooth muscle cell proliferation, insulin resistance/hyperinsulinaemia causes hypertension [3].

There is a substantial evidence to say that the prevalence of hypertension in diabetics is twice as common as compared to non-diabetics [4]. Similarly development of Type-2 diabetes is almost 2.5 times common in persons with hypertension [5].

Both hypertension and diabetes predisposes to the development of cardiovascular diseases (CVD) [3,6]. When hypertension coexists with diabetes, the risk of CVD is elevated by 75%, which further contributes to the overall morbidity and

mortality of an already high risk population [7,8]. Hypertension in Type-2 diabetic patients clusters with other CVD risk factors such as microalbuminuria, central obesity, insulin resistance, dyslipidaemia, hypercoagulation, increased inflammation and left ventricular hypertrophy [7]. This clustering of risk factors in diabetic patients ultimately results in the development of CVD, which is the major cause of premature mortality in these patients.

Aim of our study is to find the percentage of i) dyslipidemics among diabetics and correlation of the lipid profile status with the glycemic control ii) hypertensives among diabetics and correlation of blood pressure with glycemic control in Krishna and Guntur districts of Andhra Pradesh in India.

MATERIAL AND METHODS

Subjects: The present hospital based study was undertaken in NRI General Hospital in Chinakakani, Guntur district. 100 diabetic patients with a 10–15 years duration, in the age group of 45-65 years, attending the General Medicine outpatient department of the hospital during the period September to November, 2010 were included in the study. Study group involved 58 males and 42 females. Diabetics with known complications, patients with thyroid disorders, those on steroids or any medications which alter the lipid profile, coronary, cerebral or peripheral artery disorders were excluded. The study was conducted after obtaining the Institutional Ethical committee approval and written informed consent from the patients.

Methodology: The blood pressure (SBP and DBP) of all the patients were recorded by standard method. EDTA blood samples were collected for estimation of HbA1C using Biorad-D-10 by HPLC method. Fasting serum samples were collected for estimation of total cholesterol by Cholesterol oxidase method, triglycerides by Lipase/GOL dehydrogenase method and HDL-C by Direct;Non immunological dade absolute HDL method using DADE DIMENSIONS - SEIMENS.

A systolic blood pressure value of 130 mm of Hg and a diastolic blood pressure of 80 mm of Hg. were taken as under control. As for lipid profile, triglyceride (TG) <150mg/dl, Total Cholesterol(TC) <200mg/dl, and high density lipoprotein (HDL)> 45mg/dl for men and > 55mg/dl for women were taken as normal [9].

All the values obtained were statistically analyzed by using Z-test; p-test and correlation among them were observed by using Pearsons correlation tests(r- value).

RESULTS

In our study, 61% of the study group had DL and 53% had HTN, by looking into HbA1C levels it is observed that only 21% Type-2 diabetes mellitus patients were in control.

[Table/Fig-1] shows the Means of HbA1C, lipid parameters, SBP and DBP which highlights the statistically significant association with dyslipidemia and hypertension.

Variables	Mean±SD	Z value	P value *
HbA1c (g%)	7.14 ± 1.12	63.75	<0.000001
Total cholesterol (mg/dl)	204 ± 40.24	50.81	<0.0001
Triglyceride (mg/dl)	166.26± 58.68	28.33	<0.001
HDL (mg/dl)	39.56 ± 9.09	43.52	<0.0001
Systolic BP (mmHg)	126.2 ±13.28	95.04	<0.0000001
Diastolic BP (mmHg)	82.87 ± 7.66	108.18	<0.0000001

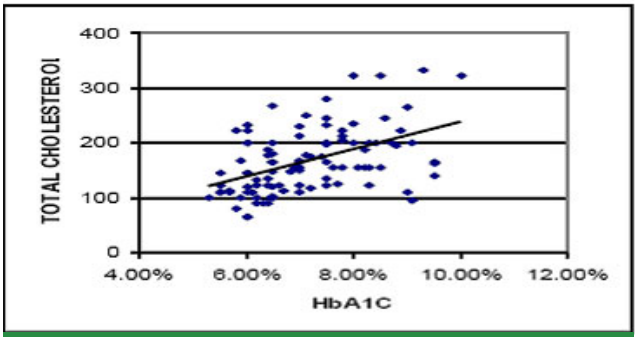
[Table/Fig-1]: Showing the glycaemic control,lipid profile and blood pressure values.

*P value is highly statistically significant

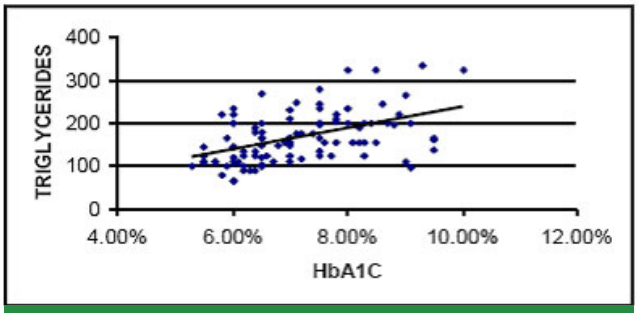
Number of subjects involved,n= 100

[Table/Fig-2] shows the positive correlation of HbA1C and Total Cholesterol (r = 0.575847055) which is statistically significant, [Table/Fig-3] shows the positive correlation of HbA1C and Triglycerides (r = 0.466239356) which is statistically significant, Figure:3 shows the negative correlation of HbA1C and HDL-C (r = -0.457116108) which is statistically significant.

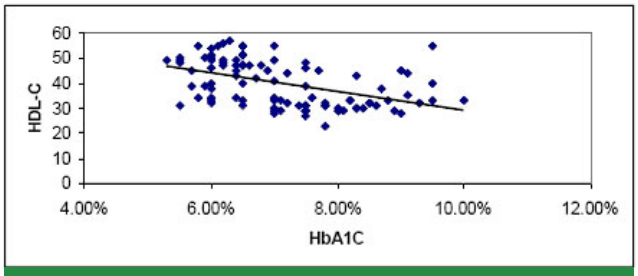
[Table/Fig-4] shows the slightly positive correlation of HbA1C and SBP (r = 0.09563479) which is not statistically significant and Figure:5 shows the slightly positive correlation of HbA1C and DBP (r = 0.130546048) which is not statistically significant.



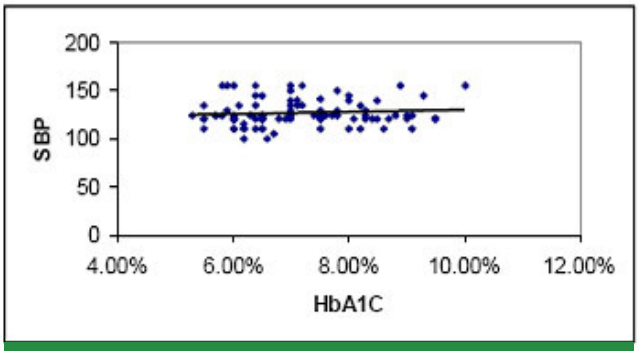
[Table/Fig-2]: Correlation of HbA1C and Total cholesterol r= 0.575847055, p<0.0001 Strong positive correlation highly statistically significant



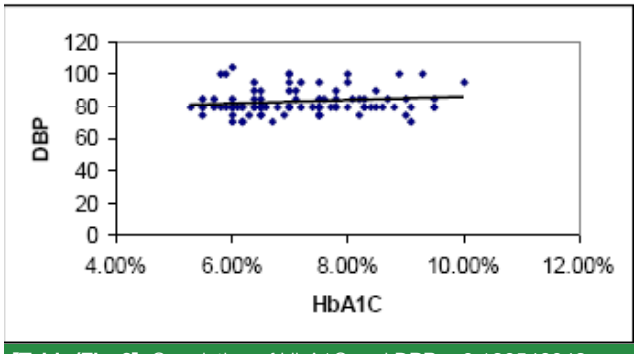
[Table/Fig-3]: Correlation of HbA1C and Triglycerides r=0.466239356, p<0.0001 Strong positive correlation highly statistically significant



[Table/Fig-4]: Correlation of HbA1C and HDL r=0.457116108, p<0.0001 Strong negative correlation highly statistically significant



[Table/Fig-5]: Correlation of HbA1C and SBP r=0.09563479, p value NS very low positive correlation not statistically significant



[Table/Fig-6]: Correlation of HbA1C and DBP r=0.130546048, p value NS very low positive correlation not statistically significant

DISCUSSION

In our study, 79% of the study group had a poor blood sugar control which could be the major reason for the existing co-morbidities like dyslipidemia (61%) and hypertension (53%). Ogbera AO reported reduced HDL-C and elevated LDL-C to be the prevalent lipid abnormalities in their patients with DM and only few were on treatment [10].

Negative association of HDL and HbA1c imply that with an elevation of HbA1c (poor glycemic control), HDL value declines. A fall in HDL is due to the accelerated activity of hepatic lipase in diabetics [11]. Positive correlation of TG and TC with HbA1c suggest that higher the HbA1c, more is the lipid values. The quantitative changes in lipid profile is due to increased availability of glucose for VLDL synthesis and decrease in lipoprotein lipase to clear VLDL from the circulation. Increased production of VLDL and reduced clearance result in the elevation of triglycerides [11].

There could be a significant role of these lipid abnormalities in the causation of hypertension. It has been proved that hypercholesterolemia induced endothelial injury results in superoxide anion production.The resultant excessive degradation of nitric oxide which disrupts the endothelium dependent vasodilatation affects the peripheral vascular resistance [12]. As Type-2 DM is an insulin resistant and hyperinsulinemic state, insulin itself can impair endothelium dependent vasodilatation [12].

Hypertension in turn can impair the glucose metabolism through various mechanisms.The exaggerated action of angiotensin II, inhibits insulin like growth factor -1(IGF-1) signalling pathway which in turn hampers the vasodilator and glucose transporting actions of IGF-1 and insulin. Inhibited IGF-1 and insulin can accentuate the vasoconstriction by diminishing endothelial nitric oxide synthase acivity, impaired nitric oxide metabolism as well as the sodium pump functioning [13]. Thus diabetes mellitus and hypertension act as vicious cycle and worsen each other.

It has also been proved that treatment with angiotensin converting enzyme inhibitors in hypertensives decreases the chances of progression to type II diabetes mellitus in high risk patients [7,14-16]. Hypertension is associated with a four fold increased mortality among patients with DM and antihypertensive therapy is found to be beneficial [17].

Dyslipidemia is a well established risk factor for CVD and when HTN coexists with DM,the risk of CVD increases by 75% and further contributes to morbidity and mortality [7,8].

CONCLUSION

Co-morbidity with HTN and DL is found to be high in the pa-

tients with type-2 DM because of poor glycemic control. The strong association of these conditions suggest that these patients may be at a higher risk of developing cardiovascular diseases. Further follow up studies need to be done in these patients(DM) to find the extent of contribution of each (DL/HTN or both) to the development of cardiovascular complications.

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