Study of factors associated with poor glycemic control in Type -2 Diabetic patients

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INTRODUCTION

Diabetes mellitus is the most common chronic diseases among adults. By 2030, number will increase to 439 million with prevalence of 7.7 %[1].Number of deaths in adult due to diabetes is estimated to be 3.96 million per year and mortality rate of diabetes in all ages is 6.8 %, at global level[2]. In India, 40 million have diabetes. By 2025 it is estimated to rise to 70 million[3]. In spite of well-defined treatment for type 2 diabetes, in majority of the people, disease is poorly controlled with existing therapies[4-5]. Studies like UKPDS[6] and DCCT[7] have proven that poor glycemic control(HbA1C>7%) is associated with increased risk for micro vascular complications. An Indian study showed that the prevalence of diabetes is high in urban India. There is a large pool of subjects with impaired glucose tolerance at a high risk of conversion to diabetes[8]. Hence it would be interesting to identify the factors associated with poor control of diabetes.

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Aims and Objectives
To determine factors associated with poor glycemic control in Type 2 diabetes.

METHODS
Participants
A total of 500 Type-2 Diabetic patients were enrolled for the study over one year period from May 2011 to April 2012. Participants were informed about the study. Informed consent was taken from each patient. Patients with Type 1 Diabetes mellitus(DM) were excluded.

Data collection

This study was approved by Sri Devraj Urs Medical college ethical committee. Personal interview was held to collect data which included age, gender, Occupation, level of education, income, and dietary habits, H/o(history of) Hypertension, H/o Smoking, Duration of diabetes, Treatment history was taken, whether patient was only on oral anti-diabetic drugs(OADs) or taking only insulin or both.

Height and weight were measured with only light clothes and without footwear. Body Mass Index (BMI) was calculated as weight in kilograms divided by height in meter squared. Blood pressure was measured using sphygmomanometer in supine position a total of three readings were taken and average of the readings was taken.

Blood samples for Glycosylated hemoglobin(HbA1c), Fasting blood sugar, Fasting lipid profile and Post prandial blood sugar were collected HbA1c was analyzed using Turbidity Inhibition.

Operational definition

Diagnosis of DM was reached according to American Diabetes Association (ADA-2011) guidelines. Glycemic status was categorized as good glycemic

control if -HbA1c< 7% and poor glycemic control if HbA1c ≥ 7%. Duration of diabetes was categorized as <7yrs and ≥7yrs.BMI was categorized using World Health Organization(WHO) South-East Asian criteria, (normal=18.5-22.9; overweight= 23-29.9; obesity- >30).Criteria for abnormal lipid profile were based on ADA-2011: Cholesterol>200mg/dl; HDL was considered low when the level is< 40 in males and <50 in females; LDL was considered high when the level was≥100mg/dl; Triglycerides ≥ 150mg/dl was considered as hypertriglyceridemia

Statistical analysis

Statistical analysis was carried out using statistical package for social services (SPSS) chi square test was used to assess statistical significance. A P value <0.05 was considered statistically significant.

RESULTS
Participants' characteristic
This study included a total of 500 patients (319 men and 181 women) with Type 2 DM. Other clinical, anthropometric and relevant characteristics are shown in Table 1 (see page 3).

Glycemic control

Out of the 500 patients enrolled for study, 393 patients had poor glycemic control. Table 2 shows the proportion of patients with poor glycemic control according to demographic, anthropometric, and clinical characteristics. In our study diabetes was more likely to be poorly controlled among male patients, elderly patients, higher BMI, hypertriglyceridemia, hypercholesterolemia and those patients who were on only anti diabetic drugs had poor glycemic control.

DISCUSSION
This study set out to study the factors associated with poor glycemic control in type 2 diabetic patients. Poor glycemic control was present in 78.6% of patients. CURES 55[9] study was conducted to determine the prevalence of, and risk factors for, diabetic neuropathy (DN) in south Indian Type 2 diabetic subjects. This study showed that age, glycated haemoglobin, and duration of diabetes, to be significantly associated with neuropathy. The CURES study showed that diabetes related complications were associated with poor glycemic control. In our study, male gender is significantly associated with poor glycemic control (p= 0.03). This is in contrast to a meta-analysis showed that males had better glycemic control than females[10]. In our study most of the people with poor glycemic control were elderly >50 years but there was no significant correlation (p=0.319) between age and glycemic control. However studies have shown that younger age is associated with poor glycemic control[11]. In our study, majority of people with higher BMI had poor glycemic control but was not statistically significant (P=0.382). In other study, BMI was significantly associated with poor glycemic control[12,13].

In our study, though a higher number of patients with poor glycemic control were falling in the longer duration of diabetes, duration of diabetes was not significantly (p=0.142) associated with poor glycemic status. In this study, patients with majority of patients with poor glycemic control were taking OADs but it was not statistically significant (p=0.304). Studies[12] have proven that insulin alone or insulin + OHAs are associated with poor glycemic control. In our study, hypertension was not associated with poor glycemic control (P=0.685).No studies have proved that there is a positive correlation between HTN and poor glycemic control.

Table 1 Anthropometric, clinical and relevant characteristics of participants

Variable	N(%)
Gender	
Male	319(63.8%)
Female	181(36.2%)
Age	
<50	152(30.4%)
51-59	156(31.2%)
>60	192(38.4%)
BMI(Kg/m^2)	
NORMAL	159(31.8%)
OVER WEIGHT	284(56.8%)
OBESITY	57(11.2%)
Duration of diabetes	
<7 years	
>7 years	301(60.2%)
	199(39.8%)
Treatment	
OAD alone	332(66.4%)
Insulin alone	14(2.8%)
combination	154(30.8%)
Hypertension	
Yes	261(52.2%)
No	239(47.8%)
Cholesterol	
≥200	381(76.2%)
<200	119(23.8%)
Triglycerides	
≥150	289(57.8%)
<150	211(42.2%)
Low density lipoprotein	
≥100	243(48.6%)
<100	257(51.4%)

Also in our study, poor glycemic patients were not associated with higher cholesterol levels (p=0.374), studies have shown that there was a positive correlation between total cholesterol and poor glycemic control[14]. In our study there was a significant correlation (p=0.008) between hypertriglyceridemia and poor glycemic control. This is in accordance with a study which proved TGS(>150) is associated with poor glycemic control[10]. In our study, high LDL level was not significantly

(0.827) associated with poor glycemic control though the highest number of patients had low LDL. In our study, low level of education was not associated with poor glycemic control (p=0.25). A Jordanian study further showed that level of education is associated with poor glycemic control[15].

Table 2 Proportion of patients with poor glycemic control according to demographic, anthropometric and clinical characteristics

Variable	Total	HbA1c≥7(%)	P value
Gender Male Female	319 181	260(81.5%) 133(73.5%)	0.03
Age <50 51-59 >60	152 156 192	125(82.24%) 123(78.84%) 145(75.5%)	0.31932
BMI(Kg/m^2) NORMAL OVER WEIGHT OBESITY	159 284 57	120(75.47%) 217(76.5%) 47(82.45%)	0.382723
Duration of diabetes <7 years >7 years	199 301	163(81.90%) 230(76.41%)	0.4123
Treatment OAD alone Insulin alone combination	332 14 154	259(78.1%) 9(64.28%) 125(81.16%)	0.3046
Hypertension Yes No	261 239	207(79.31%) 186(77.82%)	0.6855
Cholesterol ≥200 <200	381 119	296(77.69%) 97(81.51%)	0.3748
Triglycerides ≥150 <150	289 211	239(82.69%) 154(72.98%)	0.0089
Low density lipoprotein ≥100 <100	243 257	190(78.18%) 203(78.98%)	0.8276

CONCLUSION

In this Indian study, male gender and hypertriglyceridemia were significantly associated with poor glycemic control in type 2 diabetes patients. Elderly age, longer duration of diabetes, higher BMI, patients only on OADs groups though positively correlated were not significantly associated with poor glycemic control in Type 2 diabetic patients statistically.

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