Original Article

Frequency of Control of Blood Glucose in Patients with Type 2 Diabetes Mellitus at Tertiary Medical Care Unit

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ABSTRACT

OBJECTIVES: Diabetes mellitus is a medical disorder characterized by varying or persistent hyperglycemia resulting from the defective secretion or action of the insulin. As the serious complications of diabetes mellitus are associated with control and duration of the disease, so this study was planned to observe the frequency of control of blood glucose in patients with diabetes mellitus.

DESIGN: A descriptive study

SETTING: This study was designed at Mohammad Medical College Mirpurkhas Sind. Patients were collected in months of Jan-Mar 2008 in a weekly blood sugar camp arranged at MMC hospital.

METHODS: Five hundred diagnosed patients of Type 2 diabetes mellitus were included in this study. Their parameters were recorded in detail on pre-designed proforma. Control of blood sugar was evaluated by fasting blood sugar, 2 hours postprandial blood sugar, urine detailed report and hemoglobin A1C.

RESULTS: Majority of patients had unacceptable control of diabetes mellitus. Three hundred and sixty-six (73.2%) patients had poor control of blood glucose, while only 134(26.8%) patients had acceptable control of blood glucose.

CONCLUSION: This study proved that control of blood glucose remained poor, i.e. 73.2% patients remained uncontrolled even after attempts to treat the disease; it shows that because of this poor control of blood glucose huge number of patients in future will land up with serious complications. Huge number (93.2%) patients had no knowledge about the disease.

INTRODUCTION

The word diabetes was coined by Aretaeus (81–133 CE) of Cappadocia. Type 2 diabetes mellitus, a disease that was rare among youth 20 to 30 years ago, now represents as many as 45% of all cases of diabetes among youth.[1] Studies show that approximately one third of youth are overweight or obese, representing a tripling since the 1960s and 1970s. In 2006, according to the World Health Organization at least 246 million people worldwide suffer from diabetes. Its incidence is increasing rapidly, and it is estimated that by the year 2025, this number will increase to 380 million.[2] Diabetes mellitus is a medical disorder characterized by varying or persistent hyperglycemia resulting from the defective secretion or action of the insulin. There are two predominant forms of diabetes. Type 1 diabetes (previously called juvenile onset diabetes) is characterized by decreased or absent production of the insulin. Type 2 diabetes (previously called adult onset diabetes), the more common form, is characterized by body tissue resistance to insulin action, though decreased secretion of insulin can also occur. Type1 diabetes almost always requires insulin injections for survival, whereas type 2 diabetes can often be managed by dietary monitoring, weight reduction, exercise, and oral medication. Insulin is used in type 2 diabetes if oral medication proves ineffective or has intolerable side effects. Most cases of type 2 diabetes are treated with medication, although about 20% of them may be managed by lifestyle changes alone. In type 2 diabetes insulin levels are initially normal or elevated, later falling, but peripheral tissues lose responsiveness to insulin (known as "insulin resistance"). Type 2 diabetes is a more complex problem than type 1 but is often easier to treat, since insulin is still produced, especially in the initial years. Type 2 diabetes may go unnoticed for years in a patient before diagnosis, since the symptoms are typically milder. However, severe complications can result from unnoticed type 2 diabetes. Type 2 diabetes mellitus is a major cause of morbidity and mortality worldwide, and the prevalence is set to increase dramatically over the coming decades. Novel investigational techniques based on magnetic resonance spectroscopy have allowed real-time insight into the molecular defects in

patients with type 2 diabetes. The hypothesis that insulin resistance is a result of accumulation of intracellular lipid metabolites (e.g. fatty acyl CoAs, diacylglycerol) in skeletal muscle and hepatocytes is supported by observations in patients and mouse models of lipodystrophy.[3]

Criteria for diagnosis

Diabetes mellitus is diagnosed by demonstrating any one of the following:

- Fasting plasma glucose level at or above 7.0 mmol/L (126 mg/dL).
- Plasma glucose at or above 11.1 mmol/L (200 mg/dL) two hours after a 75 g oral glucose load in a Glucose Tolerance Test.
- Random plasma glucose at or above 11.1 mmol/L (200 mg/dL).

By definition, two fasting glucose measurements above 7.0 mmol/L (126 mg/dL) are considered diagnostic for diabetes mellitus.[4] Patients with fasting sugars between 6.1 and 7.0 mmol/L (110 and 125 mg/dL) are considered to have "impaired fasting glucose," and patients with plasma glucose at or above 7.8 mmol/l (140mg/dL) two hours after a 75 g oral glucose load are considered to have "impaired glucose tolerance". "Prediabetes" is either impaired fasting glucose or impaired glucose tolerance; the latter in particular is a major risk factor for progression to full-blown diabetes mellitus as well as cardiovascular disease. Glucose fluctuations during postprandial periods and, more generally, during glucose swings exhibited a more specific triggering effect on oxidative stress than chronic sustained hyperglycemia. The present data suggest that interventional trials in type 2 diabetes should target not only hemoglobin A1C and mean glucose concentrations but also acute glucose swings.[5] While not used for diagnosis, an elevated level of glucose bound to hemoglobin (termed glycosylated hemoglobin or HbA1C) of 6.0% or higher (2003 revised U.S. standard) is considered abnormal by most labs; HbA1C is primarily a treatment-tracking test reflecting average blood glucose levels over the preceding 90 days (approximately). Among the major risks of the disorder are chronic problems affecting multiple organ systems which will eventually arise in patients with poor glycemic control. Many of these arise from damage to the blood vessels. These illnesses can be divided into those arising from large blood vessel disease (macroangiopathy), and those arising from small blood vessel disease (microangiopathy). Interestingly, small vessel disease is minimized by tight blood glucose control, but large vessel disease is unaffected by tight blood glucose control. The study, for the first time, has shown that patients with type 2 diabetes mellitus and concomitant LBBB have more severe and extensive CAD and advanced left ventricular dysfunction compared with those with diabetes but without LBBB and those with isolated LBBB.[6] In fact, type 2 diabetes, a disease of glucose homeostasis, can be conceptualized as a form of accelerated aging.[7] Research published in JAMA in November 2005 also suggests that breast-feeding might also be correlated with the prevention of the disease in mothers.[8] One systematic review indicates that endogenous sex hormones may differentially modulate glycemic status and risk of type 2 diabetes in men and women. High testosterone levels are associated with higher risk of type 2 diabetes in women but with lower risk in men; the inverse association of SHBG with risk was stronger in women than in men.[9] It is well known that the complications of diabetes mellitus are directly related to level of blood sugar. Importance of proper control of blood sugar is lacking in patients and health professionals. There are few studies on this important and rapidly spreading disease. Therefore to increase the awareness of proper control of blood sugar in patients of diabetes mellitus this study was planned to evaluate the control of blood sugar among patients with Type 2 diabetes mellitus. Along with control of blood sugar, other factors were also studied in this study.

PATIENTS AND METHODS

This study was designed at Mohammad Medical College Mirpurkhas Sind. Five hundred diagnosed patients of type 2 diabetes mellitus were included in this study. Patients were collected in months of Jan-Mar 2008 in a weekly blood sugar camp arranged at MMC hospital. Their parameters were recorded in detail on pre-designed proforma. The factors evaluated were age of patient at time of presentation, sex, height, weight, waist circumference, BMI, family history of diabetes, residential address, marital status, duration of diabetes mellitus, clinical history and proper clinical examination. Patient's knowledge regarding diabetes mellitus was also recorded. Level of education was also assessed by questionnaire. Asking weather they have gone to school or madersah. They have passed primary, college or they are graduates. Control of blood sugar was evaluated by fasting blood sugar, 2 hours postprandial blood sugars, urine detailed report and hemoglobin A1C. To evaluate the complications of diabetes mellitus proper neurological examination,

proper examination of peripheral blood vessels, proper examination for autonomic neuropathy, ECG, urine examination for proteinuria, fundoscopy, lipid profile, renal and liver function tests, drug history regarding oral therapy or parenteral therapy was also recorded. The criteria for proper control of diabetes mellitus were acceptable fasting blood glucose 90 to 110 mg/dL and no higher than150mg/dL two hours after meals and glycosylated hemoglobin or HbA1C, no higher than 6% (DCCT, UKPDS). Blood glucose was checked by Aims glucometer (finger prick method), and confirmed by laboratory method.

RESULTS

In this study, during study period 500 patients of type 2 diabetes mellitus were studied, who attended the diabetic clinics. Majority of patients had poor control of diabetes mellitus. Their ages ranged between 27 years and 60 years. Two hundred and fifty (50%) patients were <40 years of age and 250(50%) were >40 years of age. When further analyzed the age of development of type 2 diabetes mellitus ranged from 20 years to 56 years. Mean age of development of type 2 diabetes mellitus was 39.1 years, and median age of development of type 2 diabetes mellitus was 37 years. More females attended the diabetic clinic. Males were 200(40%) and females were 300(60%) of total cases. Three hundred and thirty-four (66.8%) patients were from urban areas and 166(33.2%) were from rural areas. Very little number of patients had knowledge about diabetes mellitus. Their level of education was; 50% patients had never gone to school, 40%had passed primary, 8% had passed college and 2% were graduates. When asked only 34(6.8%) patients had knowledge about diabetes mellitus, while 466(93.2%) were ignorant about the disease. Family history was found in 183(36.6) patients, half of them had one parent involved and in other half of patients both parents were involved. Majority of patients had unacceptable control of diabetes mellitus. Three hundred and sixty-six (73.2%) patients had poor control of blood glucose, while only 134(26.8%) patients had acceptable control of blood glucose. When asked for duration of disease 250(50%) patients had disease for <5 years while 250(50%) patients had disease for >5 years. Overall complication rate was 350(70%). One hundred fifty (30%) patients were uncomplicated cases. When further analyzed 250(50%) patients who had disease for <5 years, had half of patients complicated while other half of patients were uncomplicated. While those 250(50%) patients had disease for >5 years, had (80%) patients complicated and (20%) patients remained uncomplicated. It was found that 466(93.2%) patients were on oral therapy while 34(6.8%) patients were on insulin therapy. Associated 100(20%) patients were hypertensive, along with diabetes mellitus

TABLE I:
PARAMETERS STUDIED IN THIS STUDY (n=500)

Parameters		No. of Patients		No. of Patients
Age	<40yrs	250 (50%)	>40yrs	250 (50%)
Sex	Females	300 (60%)	Males	200 (40%)
Social status	Rural	166 (33.2%)	Urban	334 (66.8%)
Duration of DM	<5 yrs	250 (50%)	>5 yrs	250 (50%)
Knowledge of disease	Yes	34 (6.8%)	No	466 (93.2%)
Family history	Positive	183 (36.6%)	Negative	317 (63.4%)
Control of DM	Acceptable	134 (26.8%)	Unacceptable	366 (73.2%)
Age of development of DM	Mean	39.1 yrs	Median	36 yrs
Complications	Present	350 (70%)	Absent	150 (30%)
Complications for <5 yrs	Present	(50%)	Absent	(50%)
Complications for >5 yrs	Present	(80%)	Absent	(20%)
Therapy	Oral	466 (93.2%)	Insulin	34 (6.8%)
Associated Hypertension	Yes	100 (20%)	No	400 (80%)

DISCUSSION

The control of diabetes mellitus is of utmost importance, failing which patients will land up with cluster of complications. The disease of diabetes mellitus reaches at 20.8 million people in the URACILS or 7% of the aggregate population.[10] Prevalence of diabetes mellitus is rapidly increasing around the world. American Diabetic Association has shown that an estimated 18.2 million people in the United States had diabetes mellitus, of which approximately 1 million have type 1 diabetes mellitus and remaining have type 2 diabetes mellitus.[11] Glycemic control is basic in the management of diabetes. However, the results of a recent study involving 30 academic medical centers in the United States indicated that many patients with diabetes are not achieving the target goal of <7% for glycosylated hemoglobin (A1C).[12] Medication knowledge and self-management by people with type 2 diabetes showed that, polypharmacy was common. Medication knowledge and self-management were inadequate and could lead to adverse events.[13] The findings suggest a modest positive association between the consumption of potatoes and the risk of type 2 diabetes in women. This association was more pronounced when potatoes were substituted for whole grains.[14] This has been observed that cardiovascular disease, diabetes, future coronary risk, and increasing fasting glucose levels are independently associated with erectile dysfunction.[15] Metabolic syndrome is more prevalent than diabetes and a significant independent risk factor for stroke in people without diabetes.[16] In subjects of normal weight with type 2 diabetes, baseline IGF-II concentration is inversely related to future weight gain, independent of treatment effect, strengthening the putative role for IGF-II in regulating fat mass. We propose that IGF-II measurement has potential utility in this group for targeting such individuals for early intervention.[17] It has been seen that intrarenal arterial resistance appears to play a nontrivial role in deteriorating renal function in type 2 diabetic patients. Renal arterial resistance index R/I is a noninvasive diagnostic procedure, which strongly predicts the outcome of renal function in type 2 diabetic patients, even when GFR patterns are still normal.[18] It has been observed that in a community-based sample, plasma markers of endothelial dysfunction increased risk of incident diabetes independent of other diabetes risk factors including obesity, insulin resistance, and inflammation.[19] Type 2 diabetic patients with microalbuminuria have a more severely impaired coronary endothelium-dependent vasodilation than those with normoalbuminuria. These data suggest a common pathophysiological process for both coronary vasomotor abnormalities and microalbuminuria.[20] It has been studied that sulfonylureas increase the risk of cardiovascular events; furthermore, the study adds support to a causal link by demonstrating a dose-related effect on the risk of death. Sulfonylurea drugs should therefore be relegated to third-line agents (after metformin and thiazolidinedione drugs) for managing type 2 diabetes; a conclusion also made in recently published guidelines. If sulfonylurea drugs must be included in a treatment regimen to maintain euglycemia, traditional agents should be avoided; agents such as glimepiride, glicizide and nateglinide, which have less effect on myocardial ATP-sensitive potassium channels, should be prescribed instead.[21] Another study also showed that higher exposure to sulfonylureas was associated with increased mortality among patients newly treated for type 2 diabetes. The same relation was not observed with metformin.[22] The studies support a class effect of thiazolidinedione drugs to enhance insulin sensitivity, reduce insulin secretory demands, and preserve pancreatic beta-cell function, all in association with a relatively low rate of type 2 diabetes, in Hispanic women with prior gestational diabetes.[23] The Metabolic Syndrome, a highly prevalent entity is a clustering of risk factors of metabolic origin that are accompanied by increased risks of cardiovascular disease and type - 2 diabetes mellitus.[24] The association between diabetes, obesity and hyperlipidemia is long known and has been termed "insulin resistance syndrome", syndrome "X" and metabolic syndrome by various researchers.[1] This syndrome is recognized as constellation of metabolic risk factors for the development of type 2 diabetes mellitus and atherosclerotic cardiovascular disease.[25] The natural history of diabetes indicates that insulin therapy will eventually be needed by the majority of persons with type 2 diabetes. A systematic approach presented in a positive, supportive manner helps facilitate the initiation and acceptance of insulin therapy by the patient.[26] In a population-based setting, diabetes mellitus was not associated with optic disc, rim and peripapillary atrophy measurements, retinal vessel diameters, arteriovenous nicking, focal or general retinal artery narrowing, and prevalence of age-related macular degeneration. Although diabetes mellitus was significantly correlated with higher intraocular pressure, it was not associated with glaucoma.[27]

CONCLUSION

This study showed that mean age for development of disease was 39.1 years, median age was 36 years. Most of patients had ages between 35 to 37 years at development of diabetes mellitus. Control of blood glucose remained poor. The 73.2% patients remained uncontrolled; it shows that because of this poor control of blood glucose huge number of patients in future will land up with serious complications. Vast number (93.2%) of patients had no knowledge about the disease. So it is necessary to increase the awareness about the disease in masses and health professionals. By this way in future we will be able to get acceptable control of blood glucose which will reduce the burden of complications of disease.

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