Original Article

Factors Associated with Uncontrolled Type 2 Diabetes Mellitus

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Abstract

Objective: This study aimed at determining the major risk factors present in diabetic patients attending a hospital setting.

Subjects and Methods: A total of 84 individuals with history of diabetes mellitus were selected. Based on their blood glucose and HbA1C levels they were divided into controlled and uncontrolled groups. Various factors associated with uncontrolled diabetes were recorded.

Patients and Methods: were entered on SPSS version 16 for analysis. Demographic characteristics of participants were calculated as mean±SD. Chi square test was applied to check the level of significance among different categorical variables of controlled vs. uncontrolled diabetic patients. A p-value of <0.05 was considered as statistically significant.

Results: Total 84 patients were inducted in the study with mean age of 52.3±9.7 years. Among these 55 (66%) patients were female and 29 (34%) were male. Obesity, exercise, family history and hypertension were significantly increased in patients having blood glucose levels more than the reference range despite of having regular medication. Microvascular complications were approximately equal in both groups while macrovascular complications were more frequent in controlled diabetic patients

Conclusion: Since proper control of risk factors may help to decrease the severity of diabetes and its associated complications, patients should be counselled to do regular exercise, decrease weight, quit smoking and control blood pressure.

Key words: Diabetes mellitus, Risk factors, Type 2 Diabetes.

Introduction

Diabetes mellitus is a metabolic disorder characterized by increase in individual's blood glucose level resulting from

the body's inability to produce insulin or resistance to insulin action, or both.[1] Clinically distinct types of diabetes are, type 1 that is caused by destruction of autoimmune β-cell in the pancreas, type 2 that is caused by increased resistance to action of insulin and gestational diabetes that is a form of glucose intolerance affecting pregnant women.[1]

Diabetes and its complications have a significant effect on the health, quality of life and life expectancy of patients and it contributes substantially to the health care costs. In 2013 the prevalence of Diabetes in Pakistan was 6.8% which is estimated to rise up to 8.1% in 2035.[2]

Diabetes has numerous possible long-term complications of vascular system that are traditionally categorized as microvascular and macrovascular complications. Microvascular complications include diabetic retinopathy, neuropathy and nephropathy while macrovascular complications include coronary artery disease, atherosclerosis and cerebrovascular problems, like stroke.[3] Besides these complications, glaucoma and cataracts in eye, foot problems, skin infections, infections in urinary tract and female genital tract and erection problems are also common in diabetic patients.[4] Mortality rate is therefore high in diabetic patients due to presence of these numerous complications than in their peers without diabetes.[5] There are many factors that have contributory role in progression of diabetes and its related complications. These factors comprise of genetic causes, dietary reasons, sedentary life style, obesity and age.[6] In Asian countries as compared to western countries, due to the strong genetic predisposition and early onset of diabetes, health consequences are overwhelming. Modification of risk factors associated with diabetes such as increase in physical activity, decrease of smoking and improvement in dietary habits may have a positive impact in reducing the prevalence of disease.[7,8] In Pakistan awareness about diabetes mellitus and knowledge about the changes in life style pattern in diabetic individuals is still lacking.[9] This study was planned in order to determine the major risk factors present in Pakistani diabetic population and their effect on quality of life.

Patients and Methods

In this study, 84 individuals with history of diabetes mellitus for more than 3 months were inducted from out-patient department of Punjab Social Security hospital Rawalpindi. Study was carried out from September 2014 to October 2014. An informed consent was obtained from the patients before collection of data. Based on HbA1c level (≥7%) on last visit or fasting blood glucose level of ≥126mg/dl and random blood glucose of ≥200 mg/dl on previous three continuous occasions of their visit to hospital the patients were divided in two groups, i.e. controlled and uncontrolled. Data on demographic variables (age, sex, race and residential area), smoking status, diet, physical-activity level and family history of diabetes (considered present if one or more first-degree relatives had diabetes) were obtained by direct interview. Presence of associated illness such as retinopathy, neuropathy, nephropathy, coronary artery disease and cerebrovascular problems were interviewed and confirmed from previous medical record of the patients. Body-mass index (the weight in kilograms divided by the square of the height in meters) was calculated from anthropometric measurements taken at the base-line clinic visit. Exercise was defined as moderately intense physical activity (walk) done for at least 150 minutes throughout the week.[10] Serum glucose was measured on Microlab 300[TM]. Blood pressure was measured with a random-zero sphygmomanometer with subjects in the sitting position. Hypertension was considered to be present if any of the following conditions were met: systolic blood pressure of 140 mm Hg or more, diastolic blood pressure of 90 mm Hg or more, or reported use of a medication for hypertension.[11,12]

Subjects were asked about the medication that had been prescribed to them to treat blood glucose and use of medications was directly assessed by inspection of pill bottles and packing's. In this study the collected data was analysed by using Statistical Package for Social Sciences (SPSS) software version 16.0. Demographic characteristics of participants were calculated as number (%), mean ±SD and median (IQR), in categorical, parametric and non parametric data respectively. Chi square test was applied to check the level of significance among different categorical variables of controlled versus uncontrolled diabetic patients. P-value of <0.05 was considered as statistically significant.

Results

Total 84 patients were inducted in the study with mean age of 52.3±9.7 years. Baseline characteristics of participants are shown in table 1. The controlled patients' group comprised of 20 (24%) individuals while uncontrolled group comprised of 64 (76%) individual (table 2).Despite of

Gender	Male	29(34)
	Female	55(66)
Age in years (mean±SD)		52.1±9.6
BMI	≥25 kg/m^2	24 (29)
	<25kg/m^2	60 (71)
Exercise		25 (30)
Smoking		05 (6)
Medication	Oral hypoglycaemic	52 (62)
	Insulin	08 (10)
	Both	23 (27)
	None	1 (1)
Exercise		25 (30)
Family history		54 (64)
Compliance		76 (91)
Hypertension		36 (43)
Micro-vascular complications		43 (51)
Macro-vascular complications		54 (64)
HbA1C (%age) mean±SD		8.34±1.79
Fasting blood glucose levels (mg/dl) median (IQR)		130(108-171)
Random blood glucose levels (mg/dl) median(IQR)		262(207-328)

Table 2: Frequency of risk factors and associated illnesses in control and uncontrolled diabetic group

Variables	Controlled n=20(%)	Uncontrolled n=64(%)
Age(mean±SD)	51.95±9.85	52.15±9.65
Gender Male Female	9(45) 11(55)	20(31) 44(69)*
BMI (≥25)	3 (15)	21 (33)*
Exercise	8 (40)	17 (27)*
Smoking	1 (5)	4(6)
Family history	11(55)	43(67)*
Compliance	17(85)	59 (92)*
Hypertension	6(30)	30(47)*
Micro-vascular complications	10(50)	33(52)
Macro-vascular complications	15 (75)	39(61)*

*p<0.05 is considered significant

having good compliance, chi square test revealed significantly increased percentage of obesity, physical inactivity, positive family history and hypertension in uncontrolled diabetic patients. Microvascular complications were approximately equal in both groups while macrovascular complications were found to occur more in controlled diabetic patients (table 3).

Discussion

Table 1: Baseline Characteristics of Participant's (n 84)

Variables	n (%)

In diabetes mellitus patients usually develop complications despite of availability of wide variety of antidiabetic medicines and presence of improved diagnostic procedures.[13] In our study majority of individuals (76%) has raised blood glucose levels and were labelled uncontrolled diabetics. Only 24% individuals had glucose levels within reference range. Our results are in comparable to a study conducted in Mirpur Khas, Sind which reported that the despite the efforts done to treat the diabetes, 73% patients had uncontrolled diabetes mellitus.[14] Majority of patients (92%) inducted in our study, who claimed to take medicine regularly had high glucose levels. Results of a study conducted in Karachi in 2012 showed that diabetic retinopathy was present in 28.8% diabetics. All the individuals having diabetic retinopathy were found to have uncontrolled diabetes mellitus.[15] Literature review shows that beside the appearance of complications at currently accepted diagnostic threshold of disease, complications may start at lower levels of glucose like in impaired glucose tolerance, impaired fasting glucose and even in individuals having normal glucose tolerance. In these studies other factors like increased waist circumference or obesity proved to have a significant association with development of different microvascular complications.[16,17] Similarly in our study microvascular complications were equally present in patients having controlled and uncontrolled glucose levels. Among controlled group 50% individuals had microvascular complications such as diabetic retinopathy, nephropathy and neuropathy, while in uncontrolled group 52% patients were suffering from microvascular complications. Macrovascular complications also develop early in disease process and are related to factors like obesity and early onset of disease, history of smoking and high blood pressure etc.[13,18] In our study regarding macro-vascular complications this ratio was 75% and 61% in controlled and uncontrolled groups respectively. Our study highlighted the factors affecting blood glucose levels in uncontrolled diabetes mellitus. Regarding obesity, a significant difference was observed between controlled and uncontrolled groups in our study. Among uncontrolled group 33% patients were obese while in controlled group only 15% individuals were obese. These results are in accordance to results of a study conducted in Karachi. The study comprised of 100 individuals, among them 44 were diabetic while 56 were non diabetic. The Study revealed a strong association of obesity with diabetes mellitus type 2.[19]

Regular physical activity was thought to be an important factor in management of diabetes mellitus by regulating the glucose levels and actions of insulin.[20] A systematic review of 12 aerobic training studies and 2 resistance training studies was conducted in patients of type 2 diabetes mellitus. Significant effect of exercise was observed in reducing HbA1C up to the level at which risk of diabetic complications was minimal.[21] Our study confirms this finding by revealing that in uncontrolled group 27% people had the habit of doing exercise. While 40% people who gave the history of regular physical activity were found to have glucose levels within reference range (controlled group). Majority of patients in our society do not consider the importance of exercise. Study conducted in Fauji foundation hospital, Islamabad revealed that 39% individuals knew the advantage of regular exercise in the control of diabetes mellitus and out of them only 26% carried out routine exercises to combat the disease.[22.]

Hypertension is an important risk factor in diabetes mellitus. A study conducted in outpatient department of Combined Military Hospital Lahore determines the prevalence of hypertension in 700 diabetic individuals. Hypertension was present in 70% of diabetic people.[23] In our study 43% individuals had associated hypertension. In controlled group of diabetes mellitus 30% individuals had history of hypertension while in uncontrolled group hypertension was present in 47% of individuals. A study conducted on 234 newly diagnosed diabetic individuals showed that smoking is a significant risk factor for development of diabetes mellitus. After adjustment of all possible confounding factors, current smokers and individuals who smoked for 30 years illustrated high risk of diabetes mellitus type 2 as compared to individuals who never smoked.[24] In another study conducted in 2010 cigarette smoking significantly predicted the incidence of diabetes mellitus type 2. Hazard ratio of diabetes in individuals who continue smoking was 1.31 (CI, 1.04 to 1.65). In our study majority of diabetics were non smokers. Only 6% of individuals gave history of smoking. Reason may be the predominance of female gender (66%) in study. Although the trend of smoking is gradually increasing in Pakistani females, this trend is more in women living in rural areas (8.1%) as compared to female residing in urban region (3.9%).[25]

In our study 64% individuals gave the family history of diabetes mellitus type 2. Family history was significantly positive in uncontrolled group 67while in controlled group it was 55%. Data of study conducted on 137 individuals having type 2 diabetes mellitus in 2010 revealed that as compared to non diabetics, diabetic persons have more significant (p=0.000) family history of diabetes mellitus.[26]

Conclusion

All studied risk factors had significant correlation with control of blood sugar level. Along with medications, patients should be counselled to decrease weight, quit smoking, do regular exercises and control blood pressure. A proper control of these risk factors may help to decrease the severity of diabetes and its associated complications.

Conflict of interest

This study has no conflict of interest to declare by any author.

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