EJMA

DOI: 10.14744/ejma.2022.87597
EJMA 2022;2(2):46–54

Research Article

The Relationship Between Poor Glycaemic Control and Risk Factors in Patients with Type 2 Diabetes Mellitus

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Abstract

Objectives: To identify risk factors for poor glycaemic control in type 2 diabetes mellitus patients.

Methods: We obtained data from type 2 diabetes mellitus patients including their sociodemographic characteristics, body mass index (BMI), duration of diabetes, family history of diabetes, hypertension status, and current antidiabetic medications. At their last follow-up visits, the haemoglobin A1c (HbA1c), fasting glucose level, and lipid profiles were also recorded. Patients with a HbA1C ≥ 7% or a fasting plasma glucose level≥ 140 mg/dl were considered to have poor glycaemic control.

Results: Of the 500 patients included in this study, 51.2% (n=256) were female. The average HbA1c level was 7.7% of whom 67% had a HbA1c level ≥ 7%, and 48% had a fasting plasma glucose≥ 140 mg/dl. Better glycaemic control rates (HbA1c < 7% and/or fasting plasma glucose < 140 mg/dl) were noted in patients with a shorter diabetes duration, no family history of diabetes, higher educational status, a lower waist circumference, and no hypertension, who were married and currently working, had been prescribed only oral antidiabetic agents and whose triglyceride levels were < 150 mg/dl. Independent risk factors for poor glycaemic control were longer duration of diabetes, diagnosed with diabetes at an earlier age, lower education level, higher triglyceride levels, being single and receiving insulin therapy.

Conclusion: It could be suggested that waist circumference and triglyceride levels may be important parameters than BMI and cholesterol levels for glycaemic control. However, these data should be confirmed by further prospective studies.

Keywords: Type 2 diabetes mellitus, sociodemographic characteristics, poor glycaemic control, waist circumference

Cite This Article: *Atcı MM, Pamukçu Cerciz Ö, Kayar Y, Borlu F, Altuntaş Y. The Relationship Between Poor Glycaemic Control and Risk Factors in Patients with Type 2 Diabetes Mellitus. EJMA 2022;2(2):46–54.*

Diabetes mellitus is a chronic metabolic disease characterized mainly by hyperglycaemia, glycosuria and dyslipidaemia. Regardless of the cause, diabetes mellitus is a group of disorders with a complete or partial deficiency of insulin (which may also be accompanied by insulin resistance), and it involves various pathogenic mechanisms in which hyperglycaemia plays a major role. Type 2 diabetes, which is the most common type of diabetes and is increasing in prevalence, is one of the major health problems to emerge in recent years as its complications can lead to serious morbidity and mortality.[1-3]

Although the primary goal in all diabetic patients is to

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Submitted Date: January 25, 2022 **Accepted Date:** March 06, 2022 **Available Online Date:** April 28, 2022

achieve and maintain glycaemic control, most diabetic patients never meet this milestone.[2,4,5] Lowering blood glucose levels is important because it significantly reduces both the mortality and morbidity rates in diabetic patients.[2,6]

In this present study, we evaluated a large cohort of type 2 diabetes mellitus patients and focused on the risk factors for poor glycaemic control including both sociodemographic and biochemical features, in Turkish patients.

Methods

Type 2 diabetes mellitus patients who were followed-up from 2011–2015 were included in this study. Patients with Type 1 diabetes mellitus were excluded. The diagnosis of diabetes mellitus was made according to the criteria of American Diabetes Association (ADA).[7]

The sociodemographic characteristics of the patients (age, sex, marital status, working status, and educational status) were documented. In addition, the duration of diabetes and any family history of diabetes were also recorded.

The body mass index (BMI) and the waist circumference of the patients were also recorded. Patients with a BMI < 25 kg/m^2 were defined as normal, while those with a BMI between 25–29 kg/m^2 were overweight; finally, a BMI ≥ 30 kg/m^2 was categorized as obese.[8]

Patients with a systolic/diastolic blood pressure ≥130/80 mmHg or those currently prescribed antihypertensive treatment were classified as hypertensive patients.[7]

Based on the data of the last follow-up visits of the patients, the haemoglobin A1c (HbA1c), fasting plasma glucose and lipid profile (high density lipoprotein [HDL], low-density lipoprotein [LDL], triglyceride and cholesterol) levels were recorded. Patients with a HbA1c <7% or a fasting plasma glucose level< 140 mg/dl were considered to have good glycaemic control, while those with a HbA1c≥ 7% or a fasting plasma glucose level≥ 140 mg/dl were considered to have poor glycaemic control.[7] Patients with at least one of the following parameters or patients with normal values who were currently being treated for elevated cholesterol and/or high triglycerides were considered to have dyslipidaemia: cholesterol levels ≥ 200 mg/dl, HDL < 50 mg/dl (female), HDL < 40 mg/dl (male), LDL ≥ 100 mg/dl and triglyceride ≥ 150 mg/dl.[7]

At the last follow-up visit, all the patients' diabetes medications (oral antidiabetics [OAD] and/or insulin) were also noted.

Statistical Analysis

Accordingly, in our statistical analysis, our independent variables were HbA1c and fasting plasma glucose levels, while the dependent variables were age, age at the time of diabetes diagnosis, duration of diabetes, BMI, waist circumference and cholesterol, triglyceride, LDL and HDL levels.

Firstly, we used a standard normal distribution test (Kolmogorov-Smirnov test) and graphical tools (a normal probability plot and histogram) to examine whether these variables had a normal distribution. While the patient age, age at onset of diabetes, cholesterol and LDL levels corresponded with a normal distribution, the duration of diabetes, BMI, waist circumference and triglyceride, HDL, HbA1c and fasting plasma glucose levels did not.

The data were expressed as averages, medians and percentages in tables and graphs. We used the Student T test in the analysis of the data that complied with a normal distribution and a Mann-Whitney U test for data that did not conform with the normal distribution. A Spearman correlation was used for the correlation analysis, and a chi-square test was run for the analysis of categorical variables. Potential factors related to the poor glycaemic control were analyzed using logistic regression analysis. Statistical data were analysed with the Statistical Package for the Social Sciences (SPSS). In the statistical analysis, a p-value <0.05 was considered significant.

Results

Of 500 patients (mean age: 54.7±10.7 years) included in this study, 51.2% (n=256) were female with a mean age of 54.7±10.4 years, and 48.8% were male with a mean age of 54.6±11.1 years. In our patients, the mean age at onset of diabetes was 47.8±10 years, and the mean duration of the diabetes diagnosis was five years. The average HbA1c level of our participants was 7.7% of whom 67% had a HbA1c level of ≥ 7%, and 48% had a fasting plasma glucose level of ≥ 140 mg/dl. Female patients had a statistically significantly longer diabetes duration (6 years versus 4 years) and their mean BMI (31kg/m^2 versus 28kg/m^2) and waist circumference (95 cm versus 93.5 cm) were statistically significantly higher than those of males. The average HDL level was also statistically significantly higher in female patients than in males (49 versus 42). In addition, a family history of diabetes and hypertension were statistically significantly more common in female diabetic patients than in men. More male patients had an educational status as high school or higher than female patients, and more men were also currently working. Additionally, having higher triglyceride levels and using insulin as a single agent in diabetes medication were more common in male patients than in female patients. There was no statistically significant difference between genders in terms of the onset age of diabetes, marital status, cholesterol, LDL, HbA1c and fasting plasma glucose levels.

In our study, the sociodemographic and biochemical variables were compared according to patients' HbA1c levels (< 7% or ≥ 7%) (Table 1). Patients with a shorter diabetes duration, without a history of hypertension, triglyceride levels <150 mg/dl, a lower waist circumference, a high school or higher educational status, without a family history of diabetes, currently taking only OADs, were married and were working had better glycaemic control (HbA1c levels < 7%). Sex, age at diabetes onset, BMI and levels of cholesterol, LDL and HDL were not found to be statistically significant for either good or poor glycaemic control (Table 1).

Table 1. Comparison of sociodemographic and biochemical variables according to HbA1c

Variables	HbA1c<7	HbA1c≥7	Total	p
Gender				
Female	88 (%34.4)	168 (%65.6)	256 (%100)	0.503
Male	77 (%31.6)	167 (%68.4)	244 (%100)	
Age of diabetes onset				
< 50	85 (%29.3)	205 (%70.7)	290 (%100)	0.100
50-59	53 (%36.8)	91 (%63.2)	144 (%100)	
≥ 60	27 (%40.9)	39 (%59.1)	66 (%100)	
Duration of diabetes (years)				
Median (min-max)	3 (1-28)	6 (1-35)	5 (1-35)	<0.001
Marital status				
Married	156 (%34.4)	298 (%65.6)	454 (%100)	0.042
Single	9 (%19.6)	37 (%80.4)	46 (%100)	
Family history of diabetes				
Yes	119 (%30.1)	276 (%69.9)	395 (%100)	0.008
No	46 (%43.8)	59 (%56.2)	105 (%100)	
Job status				
Working	69 (%42.3)	94 (%57.7)	163 (%100)	0.002
Non-working	96 (%28.5)	241 (%71.5)	337 (%100)	
Educational status				
Less than high school	91 (%25.0)	273 (%75.0)	364 (%100)	<0.001
High school or higher	74 (%54.4)	62 (%45.6)	136 (%100)	
Diabetes Therapy				
OAD*	140 (%47.7)	173 (%55.3)	313 (%100)	<0.001
Insulin	7 (%17.9)	32 (%82.1)	39 (%100)	
OAD + insulin	18 (%12.2)	130 (%87.8)	148 (%100)	
BMI (kg/m^2)				
< 25	24 (%44.4)	30 (%55.6)	54 (%100)	0.059
25 - 29	70 (%35.2)	129 (%64.8)	199 (%100)	
≥30	71 (%28.7)	176 (%71.3)	247 (%100)	
Waist circumference	165 (92.0 cm)	335 (96.0 cm)	500 (94.0 cm)	<0.001
Hypertension				
Yes	96 (%27.1)	258 (%72.9)	354 (%100)	<0.001
No	69 (%47.3)	77 (%52.7)	146 (%100)	
Cholesterol (mg/dl)				
≥200	81 (%30.5)	185 (%69.5)	266 (%100)	0.196
<200	84 (%35.9)	150 (%64.1)	234 (%100)	
Triglyceride (mg/dl)				
≥150	76 (%28.0)	195 (%72.0)	271 (%100)	0.010
<150	89 (%38.9)	140 (%61.1)	229 (%100)	
LDL (mg/dl)				
≥100	117 (%31.3)	257 (%68.7)	374 (%100)	0.160
<100	48 (%38.1)	78 (%61.9)	126 (%100)	
HDL (mg/dl)				
Male ≥40, Female ≥50	94 (%34.6)	178 (%65.4)	272 (%100)	0.418
Male <40, Female <50	71 (%31.1)	157 (%68.9)	228 (%100)	

Patients with an age of ≥ 60 years at the time of diabetes onset, with a shorter diabetes duration, a high school or higher educational status, a triglyceride level of < 150 mg/dl, no family history of diabetes, a lower waist circumference and no history of hypertension, married, working and currently prescribed only OAD medications had statistically significant lower fasting plasma glucose levels (< 140 mg/dl) (Table 2). Sex, BMI and cholesterol, LDL and HDL levels were not significantly related with either good or poor glycaemic control in terms of fasting plasma glucose levels (p>0.05) (Table 2).

Table 2. Comparison of sociodemographic and biochemical variables according to Fasting Plasma Glucose

Variables	Fasting Plasma Glucose <140	Fasting Plasma Glucose ≥140	Total	p
Gender				
Female	133 (% 52.0)	123 (% 48.0)	256 (% 100)	0.983
Male	127 (% 52.0)	117 (% 48.0)	244 (% 100)	
Age of diabetes onset				
<50*	133 (% 45.9)	157 (% 54.1)	290 (% 100)	0.002
50-59	82 (% 56.9)	62 (% 43.1)	144 (% 100)	
≥60	45 (% 68.2)	21 (% 31.8)	66 (% 100)	
Duration of diabetes (years)				
Median (min-max)	3 (1-32)	7(1-35)	5 (1-35)	<0.001
Marital status				
Married	248 (% 54.6)	206 (% 45.4)	454 (% 100)	<0.001
Single	12 (% 26.1)	34 (% 73.9)	46 (% 100)	
Family history of diabetes				
Yes	192 (% 48.6)	203 (% 51.4)	395 (% 100)	0.003
No	68 (% 64.8)	37 (% 35.2)	105 (% 100)	
Job status				
Working	102 (% 62.6)	61 (% 37.4)	163 (% 100)	0.001
Non-working	158 (% 46.9)	179 (% 53.1)	337 (% 100)	
Educational status				
Less than high school	167 (% 45.9)	197 (% 54.1)	364 (% 100)	<0.001
High school or higher	93 (% 68.4)	43 (% 31.6)	136 (% 100)	
Diabetes treatment				
OAD*	204 (% 65.2)	109 (% 34.8)	313 (% 100)	<0.001
Insulin	10 (% 25.6)	29 (% 74.4)	39 (% 100)	
OAD+insulin	46 (% 31.1)	102 (% 68.9)	148 (% 100)	
BMI (kg/m^2)				
< 25	33 (% 61.1)	21 (% 38.9)	54 (% 100)	0.092
25 - 29	110 (% 55.3)	89 (% 44.7)	199 (% 100)	
≥30	117 (% 47.4)	130 (% 52.6)	247 (% 100)	
Waist circumference	260 (92.0 cm)	240 (96.0 cm)	500 (94 cm)	<0.001
Hypertension				
Yes	161 (% 45.5)	193 (% 54.5)	354 (% 100)	<0.001
No	99 (% 67.8)	47 (% 32.2)	146 (% 100)	
Cholesterol (mg/dl)				
≥200	128 (% 48.1)	138 (% 51.9)	266 (% 100)	0.064
<200	132 (% 56.4)	102 (% 43.6)	234 (% 100)	
Triglyceride (mg/dl)				
≥150	122 (% 45.0)	149 (% 55.0)	271 (% 100)	0.001
<150	138 (% 60.3)	91 (% 39.7)	229 (% 100)	
LDL (mg/dl)				
≥100	187 (% 50.0)	187 (% 50.0)	374 (% 100)	0.123
<100	73 (% 57.9)	53 (% 42.1)	126 (% 100)	
HDL (mg/dl)				
Male ≥40, Famele ≥50	149 (% 54.8)	123 (% 45.2)	272 (% 100)	0.174
Male <40, Famele <50	111 (% 48.7)	117 (% 51.3)	228 (% 100)	

Additionally, there was a highly positive correlation between the HbA1c, which shows the glucose levels of the diabetic patients over a long period of time, and the fasting plasma glucose levels ($y = 0.028.x+4$, $R^2 = 0.645$) (Fig. 1).

In the multivariate analysis of risk factors for poor glycaemic control in terms of HbA1c; it was found that glycaemic control was worse in patients with longer duration of diabetes, lower education level, and higher triglyceride levels. (Table 3) In multivariate analysis of risk factors for poor glycaemic control in terms of fasting plasma glucose, it was found that glycemic control was worse in patients diagnosed with diabetes at an earlier age, in those who were single, with higher triglyceride levels and those receiving insulin therapy (Table 4).

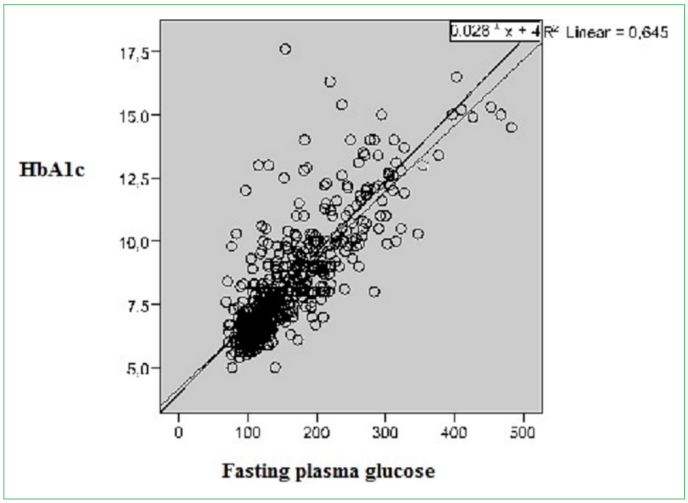

Figure 1. The relationship between HbA1c and fasting plasma glucose level.

Discussion

In this present study, we evaluated a large cohort of type 2 diabetes mellitus patients from Turkey to identify the risk factors (including sociodemographic and biochemical features) for poor glycaemic control.

The mean age of our study group was 57.7±10.7 years and 51.2% were female. The mean age and sex of diabetic patient population of our study were similar to many reports.[2,3,9-12] While most diabetic patients in developed countries range in age from 45–64, people over 64 years represent the majority of diabetics in developing countries.[13,14]

The mean duration of diabetes in the patients who participated in our study was five years. In most of the studies the duration of diabetes was longer than ten years.[3,15-17] Therefore, the diabetes duration in our study was lower compared to many studies.[3,15-17]

The correlation between educational status and poor glycaemic control has been evaluated in many studies in the literature.[3,12,15,17-21] In most of them it was determined that poor glycaemic control was significantly higher in patients with a low educational status.[4,17-19,21] Similarly, in our study, poor glycaemic control was significantly less prevalent in patients who had a high school education and above. However, the correlation between educational status and poor

Table 3. Multivariate analysis of risk factors for poor glycaemic control in terms of HbA1c

Variables	OR	95% CI for OR		p
Duration of diabetes				
Years	1.111	1.061	1.163	<0.001
Marital status				
Married vs single	0.493	0.221	1.098	0.084
Family history of diabetes				
Yes vs no	1.400	0.856	2.290	0.180
Job status				
Working vs non-working	1.049	0.660	1.667	0.839
Educational status				
High school or higher vs less than high school	0.395	0.247	0.634	<0.001
BMI (kg/m^2)				
< 25 (ref)			0.726	
25-29	1.281	0.633	2.594	0.491
≥30	1.124	0.497	2.542	0.778
Waist circumference				
cm	1.014	0.989	1.040	0.282
Hypertension				
Yes vs no	1.274	0.804	2.019	0.303
Triglyceride level (mg/dl)				
≥150 vs <150	1.586	1.047	2.402	0.030

Table 4. Multivariate analysis of risk factors for poor glycaemic control in terms of fasting plasma glucose levels

Variables	OR	95% CI for OR		p
Age of diabetes onset				
<50* (ref.)	1.000			0.014
50-59	0.616	0.385	0.987	0.044
≥60	0.415	0.214	0.804	0.009
Duration of diabetes				
years	1.019	0.984	1.054	0.296
Marital status				
Married vs single	0.390	0.184	0.829	0.014
Family history of diabetes				
Yes vs no	1.545	0.919	2.597	0.101
Job status				
Working vs Non-working	0.625	0.387	1.009	0.055
Educational status				
High school or higher vs Less than high school	0.678	0.408	1.124	0.132
Diabetes treatment				
OAD* (ref.)	1.000			<0.001
Insulin	4.765	2.106	10.781	<0.001
OAD+Insulin	3.677	2.303	5.872	<0.001
Waist circumference				
cm	1.009	0.990	1.029	0.354
Hypertension				
Yes vs no	1.584	0.968	2.590	0.067
Triglyceride (mg/dl)				
≥150 vs <150	1.857	1.235	2.791	0.003

glycaemic control has not been found in another similar studies.[3,20]

When the effect of marital status on glycaemic control was evaluated according to HbA1c, no significant difference was found between single or married people. Interestingly, in two similar studies in which marital status were evaluated, no significant difference was found between single and married people according to HbA1c, similar to our study.[3,18] However, 73.9% of single patients had a fasting plasma glucose level of ≥140 mg/dl, and their glycaemic control was significantly worse than that of married patients.

In our study the effect of employment status on glycaemic control has also been investigated. We noted that the working patients had better glycaemic control than the non-working patients and this difference was significant for both parameters (HbA1c and fasting plasma glucose) that we used to evaluate glycaemic control. We think that a more regular schedule and therefore more regular mealtimes that are reported by patients who work have a positive effect on glycaemic control. However, in some studies, it was reported that the participants' job status did not affect their glycaemic control.[3,18]

When we investigated the effect of a family history of diabetes on glycaemic control, we found that patients with a family history had worse glycaemic control compared to patients without a family history of diabetes based on both the HbA1c and fasting plasma glucose levels, similar to other studies.[11] However, in some studies, the effect of a family history of diabetes on glycaemic control could not be demonstrated.[6,19]

In our study, hypertension had been diagnosed in 70.8% of patients. In other similar studies, most of the participants (~70%) also reported to have hypertension.[22] In addition, 72.9% of patients with a HbA1c ≥ 7% and in 27.1% of patients with a HbA1C < 7% had hypertension and the difference was statistically significant. A similar result was obtained when the same factors were evaluated using the fasting plasma glucose. Other studies have not reported hypertension as a risk factor for poor glycaemic control in diabetic patients.[4]

In our study, no significant relationship was found between the age at diabetes onset and poor glycaemic control in terms of HbA1c, similar to study conducted by Khattab et al.[4] However, in another study, the authors reported that glycaemic control was worse in patients over 50 years of age.[23] In contrary, we have found that 54.1% of patients under 50 years of age had poor fasting plasma glucose control, which has also been shown as a risk factor for poor gly-

caemic control in our multivariate analysis. It has also been emphasized in many reports that an early age at diabetes onset was associated with poor glycaemic control.[24,25]

The average HbA1c value of the patients included in our study was 7.7%; there was no significant difference between male and female patients. In 67% of our patients, the HbA1c was ≥ 7%, and 48% of them had a fasting plasma glucose ≥ 140 mg/dl. Therefore, we found that the glycaemic control in most of our patients was poor. It is noteworthy that in almost all similar studies, glycaemic control could not be achieved in 60-70% of patients, similar to the findings of our study.[4,22,23,26,27] In this context, it can be inferred that patients and doctors all over the world have difficulty achieving glycaemic control, and success rates are low.

As the duration of diabetes increases, glycaemic control worsens which has also been shown in our study.[3,20,22,28-30] Similarly, in the majority of relevant studies it has been reported that a longer diabetes duration was related to poor glycaemic control.[3,4,27,30-32] In contrast, in another study evaluating the risk factors related to poor glycaemic control reported that 81.0% of patients with poor glycaemic control had a diabetes duration of <7 years.[23]

In our study, 59% of women and 39.3% of men were obese, and the difference was statistically significant, similar to other studies.[3] In addition, there was no significant relationship with poor glycaemic control in terms of HbA1C and fasting plasma glucose levels and BMI of patients, similar to some studies.[22] However, in most studies it was reported that the relationship between obesity and poor glycaemic control was significant.[3,4,11,17,21]

It is known that waist circumference is an important factor in poor glycaemic control. In our study, we found that patients with higher HbA1c and fasting plasma glucose levels had statistically significantly higher waist circumference values compared to other patient groups. Our results suggest that waist circumference may be a more important parameter than BMI in predicting glycaemic control in patients with type 2 diabetes.

Diabetes mellitus is not only a carbohydrate metabolism disorder but is also a condition of lipid and protein metabolism dysfunction. Dyslipidaemia in diabetes is characterized by high triglyceride levels, low HDL cholesterol and an increased LDL level.[33] In our study, there was no significant difference between genders in terms of the total cholesterol, triglyceride and LDL levels. When the HDL level was evaluated separately from all other factors, female patients had higher HDL levels than males. When the lipid profiles were compared to both the HbA1c and fasting plasma glucose levels, there was no difference in the two groups in terms of total cholesterol, HDL and LDL levels. The triglyceride levels were statistically significantly higher in patients with poor glycaemic control. Consequently, while there was no significant relationship between glycaemic control and cholesterol (total, HDL and LDL) levels in our study, high triglyceride levels were observed to be parallel to poor glycaemic control in terms of HbA1C and fasting plasma glucose levels. Similarly, the study of Gopinath et al. found that while there was no significant difference between cholesterol levels and poor glycaemic control, there was a significant relationship between higher triglyceride levels and poor glycaemic control.[23] Although some studies have reported the significance between high cholesterol levels and poor glycaemic control, our results suggest that hypertriglyceridaemia may be another important factor.[19] Diabetes is considered as a risk factor equivalent to coronary heart disease.[34] Therefore, clinicians must take an aggressive approach to the treatment of dyslipidaemia in diabetic patients. In a study evaluating the success of dyslipidaemia treatment in 276 diabetic patients in Turkey, only 8.7% of their patients had optimal LDL levels, while 24.3% demonstrated acceptable LDL levels; although statin therapy was recommended to the vast majority of these patients, treatments were insufficient due to either inadequate follow-up or non-compliance of the patients.[35]

More than half (62.6%) of participants in our study were on oral OAD alone (with no insulin as a component of their drug therapy). This percentage was consistent with the findings of similar studies.[3] Furthermore, it was observed that 66.4% of the patients with good glycaemic control took only OADs, while the group of patients with a HbA1C ≥ 7% had a higher rate of insulin therapy, consistent with the literature.[17] When the fasting plasma glucose levels were evaluated, we found that 65.2% of patients who were prescribed only OADs had good glycaemic control. In light of this information, we suggest that the use of OADs alone is sufficient to achieve glycaemic control in most patients. However, glycaemic control could not be achieved despite combination therapy in most of our patients, similar to many studies.[36,37] Therefore, it can be said that the progression of diabetes comes out over time and combination therapies or dose increases should be considered in these patients.

In the multivariate analysis of risk factors for poor glycaemic control in terms of HbA1c or fasting plasma glucose; we found that glycaemic control was worse in patients with longer duration of diabetes, diagnosed with diabetes at an earlier age, lower education level, higher triglyceride levels, single and those receiving insulin therapy. In a recent study conducted in a tertiary healthcare setting with 357 patients diagnosed as type 2 diabetes, the predictors statistically significant with poor glycaemic control in the multivariable

analysis were being female gender, BMI (> 30 kg/m^2) and poor medication adherence, unlike our results.[3] In another study, having low education, being morbidly obese, being on insulin therapy, having cardiovascular disease has been shown in multivariate analysis significantly affecting patients' glycaemic control, similar to our results.[17]

Limitations of the study

First of all, the retrospective study design of our study was one of the most important limitations. Another limitation was fasting blood glucose measurements; obtained from medical records regarding the last visit of patients that may lead to underestimated or overestimated levels. Additional factors missing from our data were participants' microvascular and macrovascular complications of diabetes and accompanying coronary heart disease.

Conclusion

We observed that most patients included in this study failed to achieve glycaemic control. The parameters most closely related to poor glycaemic control were diabetes duration, a family history of diabetes, job status, educational status, medications as therapy, waist circumference, triglyceride levels and hypertension. However, these data should be confirmed by prospective studies performed in larger patient populations.

Disclosures

Ethics Committee Approval: This study was conducted in accordance with the Declaration of Helsinki and approved by the Ethics Review Committee (Approval number: 05/03/2013-168).

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – M.M.A., Y.K., F.B., O.P.C., Y.A.; Design – M.M.A., Y.K., F.B., O.P.C., Y.A.; Supervision – M.M.A., Y.K., F.B., O.P.C., Y.A.; Materials – M.M.A., Y.K., F.B., O.P.C., Y.A.; Data collection &/or processing – M.M.A., O.P.C., F.B., Y.A.; Analysis and/or interpretation – M.M.A., Y.K., O.P.C.; Literature search – M.M.A., Y.K., Y.A., F.B.; Writing – M.M.A., O.P.C.; Critical review – M.M.A., Y.K., F.B., O.P.C., Y.A.

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