Original Article

Factors Affecting Glycemic Control in Type 2 Diabetics and Diabetics' Attitude towards the Disease

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Abstract

Background: The International Diabetes Federation indicates that Turkey is among the first five countries with the highest rate of diabetes in terms of both prevalence and population.
Objective: This cross-sectional study aims to determine the factors that affect glycemic controls, and attitudes of type 2 diabetes (T2DM) patients.
Methods: This study included patients who visited the internal medicine and endocrinology polyclinics of the hospitals in three different regions of Turkey during September and December of 2015. Regression analysis was carried out for independent groups to analyze the relationships between the variables.
Results: The present study indicated that insulin treatment, health perception, and duration of diabetes affected glycemic control and explained 17.0% of the total variance, while insulin treatment and coexistence of other chronic diseases affected diabetes attitudes and explained 4.0% of the total variance. Type 2 diabetes patients had more positive attitudes toward diabetes.
Conclusion: In addition to diabetes, coexistence of a chronic disease negatively affected patients' attitudes towards their disease. A longer duration of type 2 diabetes, insulin treatment and patients' perception that they had poor health were found to be related to a higher level of HbA1c in the patients.

Keywords: Type 2 diabetes, attitude, glycemic control.

Introduction

The World Health Organization (WHO) reports that the rate of diabetes is rising, and diabetes and its complications continue to be serious community health problems in developing countries such as Turkey (WHO, 2016). The prevalence of diabetes was estimated to be 9% in 2014 (WHO, 2016 b). The latest International Diabetes Federation (IDF) Diabetes Atlas indicates that Turkey is among the first five countries with the highest rate of diabetes in terms of both prevalence and population. Turkey also has the highest prevalence of diabetes (IDF, 2015). Predictions in the IDF 2013 Diabetes Atlas and results of the Turkish Diabetes Education Programme II (TURDEP II), the most comprehensive survey on diabetes, demonstrate that diabetes is spreading faster than expected in Turkey and has already reached the numbers estimated for twenty years later (IDF, 2015; Satman et al., 2013).

The most important factor in diabetes control is to ensure that diabetes patients comply with their treatment and care, maintain their self-care at the highest level, and be familiar with their disease (Chew et al., 2015). In short, diabetes patients should have sufficient knowledge and skills regarding self-care as well as positive attitudes. Patients' diabetes-related attitudes are very critical in treatment (Chew et al., 2015). Diabetes patients who believe that type 2 diabetes is less severe than other types of diabetes and easier to manage in terms of treatment, care and complications do not comprehend the seriousness of their disease, and are hard to motivate for effective self-management. Beliefs and attitudes should be addressed first for these patients (Kartal and Inci, 2011; Hermanns et al., 2017).

Attitudes can affect a patient's emotional life, beliefs, and behavioral tendencies in long term. But attitudes can only be observed when they reflect on behaviors (Sahin, 2015). Diabetes treatment is mainly based on patients' attitudes and behaviors about their own health, and particularly their treatment. Effective management and controlling T2DM requires behavioral compliance. A significant relationship was found between the beliefs and attitudes of patients and the level of behavioral compliance which is necessary for effective treatment (Azimah et al., 2010). Studies have demonstrated that patients with positive attitudes have better glucose controls, greater self-care skills, and a higher level of knowledge on diabetes (Parsons et al., 2017; Escalada et al., 2016; Cosansu and Erdogan, 2014; Vincent et al., 2013; Kartal and Inci, 2011). These results reveal the importance of evaluating patients' attitudes towards their care and treatment in controlling and managing the disease.

Aim

Diabetics should be evaluated to see if they hold false beliefs. Negative attitudes can be turned into positive ones by identifying the false beliefs. This study aims to analyze the glycemic control and attitudes of diabetes patients toward their disease.

Methods

Research design

This cross-sectional study was conducted in the diabetes polyclinic of three central hospitals which represent three different geographical regions of Turkey (Black Sea, Aegean and Southeastern Anatolia). These regions were selected for their development levels and cultural features (such as nutrition and exercise).

Study population

The present study included patients who were diagnosed with diabetes after visiting the internal medicine and endocrinology polyclinics of central hospitals in three different regions of Turkey. The sample size was calculated using G*Power software, version 3.1 (Faul et al., 2007). For the regression analysis planned with nine predictor variables, the values were regarded to be as follows: effect size=0.15, 80% power and p=0.05. Consequently, the sample size was found to be 114. Study population included 568 patients who visited internal medicine clinics in three provinces while the study was being conducted. Of the patients, 227 did not accept to participate and were excluded. Therefore, the sample included 341 patients. The sample was obtained at a value higher than the desired according to the power analysis, and the recommended sample size defined in the previous studies was achieved. All patients participated in the study on a volunteer basis.

Every patient who is diagnosed with diabetes and received oral medications or insulin therapy is trained by the physicians or diabetes nurses in Turkey. Diabetes training nurses were available in all institutions where the research was conducted. Patients who were included in the research were those who had received training from this unit. Patients selected for the study included those who were diagnosed with T2DM (symptoms displayed for at least one year), 18 years old or older, willing to participate in the study, communicative and able to speak Turkish, thus had no hearing or speaking problems. Three hundred forty one patients meeting the inclusion criteria agreed to participate in the study during September and December of 2015.

Instruments

The information form used in this study included 21 questions about socio-demographic characteristics and disease as well as the Diabetes Attitude Scale- 3 (DAS-3). The information form was prepared by the researchers after reviewing the relevant literature (Hermanns et al., 2017; Eid et al., 2017; Chew et al., 2015; Cosansu and Erdogan, 2014; Kartal and Inci, 2011). This form included questions on personal characteristics of the patients (age, gender, marital status,

residence, income level, presence of chronic disorders, and compliance to treatment) and diabetes characteristics (duration, type of treatment, HbA1c and so on). The most important parameter of disease control for the diabetics is the HbA1c level. As the attitude of diabetes patients towards diabetes develops, their disease control is expected to get better. Some studies suggested that attitudes towards diabetes affect HbA1c levels (Deeb et al., 2017; Parsons et al., 2017; Escalada et al., 2016; Cosansu and Erdogan, 2014; Ozcelik et al., 2010). Patients' HbA1c values covering the previous three months were used in the collection of data.

Table 1. The characteristics and model variables of the patients with type 2 diabetes (n=341)

Characteristic	N	%
Regions		
Southeastern	200	58.7
Black Sea	73	21.4
Aegean	68	19.9
Gender		
Female	218	63.9
Male	123	36.1
Age		
≤65	279	81.8
>65	62	18.2
Marital status		
Married	315	92.4
Single	26	7.6
Level of education		
≤5 years	270	79.2
>5 years	71	20.8
Health perception		
Good	214	62.8
Poor	127	37.2
Duration of the disease		
≤10 years	255	74.8
>10 years	86	25.2
Hypoglycemia		
Yes	123	36.1
No	218	63.9
Chronic Disease*		
Yes	200	58.7
No	141	41.3
Treatment		
Oral medication	127	37.2
Insulin	214	62.8
HbA1c		
Good (≤7)	263	77.1
Bad (>7)	78	22.9
*= Other chronic diseases than diabetes (hypertension, cardiac diseases, rheumatism etc.)		

Table 2. Logistic regression and Diabetes Attitudes and HbA1c

Variable	Diabetes Attitudes*				HbA1c**			
	β	SE	p	Exp (β)	β	SE	P	Exp (β)
Diabetes treatment Insulin **versus** oral medication	0.600	0.238	0.012	1.822	1.007	0.276	0.000	2.737
Chronic disease Yes **versus** no	-0.497	0.232	0.032	0.608	-	-	-	-
Health perception Good **versus** bad	-	-	-	-	-0.632	0.296	0.033	0.532
Duration of the disease >10 years **versus** ≤10years	-	-	-	-	-1.683	0.490	0.001	0.186
Constant	0.519	0.196	0.008	1.681	-1.183	0.221	0.000	0.306

Diabetes Attitudes Hosmer and Lemeshow test: X^2:0.156, p:0.925, Nagelkerke R^2:%4
HbA1c: Hosmer and Lemeshow test: X^2: 4.072, p:0.539, Nagelkerke R^2: 17%
*The reference category for diabetes attitudes is "Undecided + I strongly disagree +disagree".
**The reference category for HbA1c is "Good glycemic control (HbA1c≤7)".

The Diabetes Attitude Scale was developed by the U.S. National Diabetes Commission in 1975 to determine the facilities and obstacles for a diabetes patient in following the treatment diet (Ozcelik et al., 2010). The scale was tested for validity and reliability for the Turkish population by Ozcan (Ozcan, 1999). The DAS-3 uses a Likert scale format ranging from 1 (I strongly disagree) to 5 (I strongly agree). The 5th, 6th, 12th, 18th, 23rd and 24th items of the scale are reversely graded (1= I strongly agree, 5= I strongly disagree). The DAS-3 comprises 7 sub-groups which are special educational needs, attitude towards patient compliance, seriousness of type 2 diabetes, blood glucose control and complications, the effect of diabetes on patients' life, attitude towards patient autonomy and attitude towards team care. A score higher than 3 shows a _positive attitude_ and a score of 3 points or lower shows a _negative attitude_. Higher or lower scores strengthen the positive or negative attitudes (Polit, 2010).

Data collection

Data were collected by the researchers through individualized interviews with patients at the endocrine outpatient clinics. Participants were briefly informed by the researchers about the aim and methods of the study as well as the information forms and the DAS-3. The information form and the scale took approximately 30 minutes to complete. Participants were also given the opportunity to ask any question related to the forms.

Ethical considerations

Approval was obtained from the Ethics Committee of the Faculty of Medicine, Gaziantep University. Informed consent was obtained from the patients after the study aim was explained to them. Confidentiality was ensured coding the questionnaires which were kept in a locked file.

Data analysis

Data were analyzed using the SPSS version 18.0. Frequencies and percentages were used to describe the demographic and physiological variables. The binary logistic regression was used with explanatory variables to analyze factors that were associated with the DAS-3 and glycemic control. Stepwise forward likelihood ratio method was used to examine the standardized residual for variables and multicollinearity among the independent variables prior to the construction of the regression model (Polit,

2010). Statistically significant levels were set at *p* value less than 0.05.

Results

Table 1 presents the sociodemographic characteristics and descriptive statistics of the patients with T2DM. Of the patients, 58.7% were from the Southeastern Anatolia region, 21.4% were from the Black Sea region, and 19.9 were from the Aegean region. Of the patients with type 2 diabetes, 63.9% were females. Of them, 92.4% were married. Of those married patients, 81.8% were 65 years old or older, and their mean age was 55.00 ± 1.16. Of the patients, 79.2% had attended school for five years or less, and 20.8% had attended school for five years or more. Of the patients with type 2 diabetes, 62.8% had good health status, and 37.2% had poor health status. Of them, 74.8% had been diagnosed with type 2 diabetes in the last 10 years, and 25.2% had been diagnosed with type 2 diabetes more than 10 years ago. Patients had been diagnosed with type 2 diabetes for 8.13 ± 6.19 years on average. Of the patients, 36.9% stated that they had not experienced hypoglycemia, and 36.1% stated that they had experienced. Of them, 58.7% had a chronic disease, and 41.3% did not have a chronic disease. Of the patients, 62.8% took insulin, and 37.2% took oral medicine. 77.1% of the patients had an HbA1c score lower than 7.0, and 22.9% had an HbA1c score greater than 7.0. Their mean HbA1c score was 9.80 ± 3.43.

The sub-scales of the DAS-3 and its mean total score were examined. The lowest mean score in all sub-scales was 2.61 ± 1.33, while the highest mean score was 4.55 ± 0.43. The fact that the strongest positive attitude was obtained from the special educational needs sub-scale and the weakest positive attitude was obtained from the seriousness of type 2 diabetes sub-scale is particularly remarkable. The total mean score in the DAS-3 was found to be 3.97 ± 0.28, indicating a moderately positive attitude.

Table 2 shows attitudes of patients with T2DM towards their disease, and the final model for the predictors of HbA1c variables. The results of logistic regression analysis demonstrated that the patients with T2DM who received insulin treatment were approximately 1.8 times more likely to have more positive attitudes compared to the patients who used oral anti-diabetic drugs. The patients with chronic diseases were approximately 0.6 times less likely to have positive diabetes attitudes, compared to the patients without any additional chronic diseases (Table 2).

Patients who received insulin treatment were approximately 2.7 times more likely to have an ineffective glycemic control (HbA1c > 7) compared to the patients who used oral anti-diabetics. The patients who had a good health perception were 0.5 times less likely to have an ineffective glycemic control compared to the patients who had a perception of poor health. The patients with diabetes who had been displaying symptoms for more than ten years were 0.1 times less likely to have an ineffective glycemic control compared to those who had displayed diabetes symptoms for less than ten years (Table 2).

Discussion

This study analyzed the factors that affect glycemic control and attitudes of people with T2DM diabetes towards their disease. The study suggested that insulin treatment, health perception, and duration of diabetes affected glycemic control and explained 17% of the total variance, while insulin treatment and coexistence of other chronic diseases affected diabetes attitudes and explained 4% of the total variance.

The main problem of people with diabetes is the deterioration of glycemic control and the complications that develop due to the deteriorated glycemic control (Polit, 2010; Ozcan, 1999; DCCTR, 1993). The American Diabetes Association (2015) has recommended medical nutrition treatment, physical activity, self-monitoring of blood glucose, and oral anti-diabetics or insulin for glycemic control (ADA, 2015). Use of insulin plays an important role in the treatment of diabetes (Escalada et al., 2016). This study indicated that the patients who received insulin treatment were more likely to have a poor glycemic control compared to the patients who used oral anti-diabetics. The literature reports that insulin has a positive effect on glycemic control when properly administered (ADA, 2015; Wallia and Molitch, 2014). One study suggested that the biggest obstacles for the positive effect of insulin treatment on glycemic control were compliance to the treatment and patients' preferences (Wallia and Molitch, 2014). While Bayindir Cevik et al. (2015) found a significant decrease in the HbA1c levels of people with type 2 diabetes in Turkey (Bayindir Cevik et al., 2015), Celik et al. (2015) found a significant improvement in the insulin administration skills and glycemic controls of

patients who were trained on insulin administration technique (Bayindir Cevik et al., 2015; Celik et al., 2015). The higher possibility of poor glycemic control found in the present study may be the result of the inability of patients with diabetes to manage insulin treatment.

The present study also indicated that the patients who had a perception of good health were less likely to have a poor glycemic control. The literature states that diabetes complications cause people with diabetes to have a perception of poor health (Goie and Naidoo, 2016; Adejoh, 2014). In the present study, a low number of patients had a poor glycemic control since approximately one-third of patients had complications of diabetes.

This study also found that the patients displaying diabetes symptoms for more than ten years were less likely to have a poor glycemic control. A study on the relationship between the duration of diabetes and glycemic control found that the HbA1c level of patients showing diabetes symptoms for ten years and more was statistically and significantly higher (Gao et al., 2013). However, another study found no statistically significant difference, although the HbA1c level of patients who had T2DM for ten years or more was higher (An and Kim, 2012). The difference in the findings of the present study may be due to another variable that could not be estimated.

The literature shows that the people with T2DM who use insulin had more positive attitudes than the people who use oral anti-diabetics (Parsons et al., 2017; Niroomand et al., 2015). However, the literature also includes studies that did not find a significant relationship between insulin treatment and attitudes towards diabetes (Lou et al., 2014; Kartal et al., 2008; Ozcan, 1999). A study conducted in Malaysia suggested that the drug compliance of patients who used insulin was better than that of the patients who used oral anti-diabetics (Tan and Magarey, 2008). In the present study, the positive attitudes of patients who used insulin may be due to the fact that the use of insulin was complex, and thus patients did more research for information and gained experience on effectively managing insulin treatment.

The present study also found that T2DM patients who had a chronic disease and diabetes were less likely to have positive attitudes. No studies were found in the literature analyzing the relationship between the attitudes towards diabetes and having a chronic disease other than diabetes.

Diabetics need to have adequate knowledge, skills and positive attitudes to successfully manage diabetes every day (Parsons et al., 2017; Escalada et al., 2016; Azimah et al., 2010). Having a chronic disease other than diabetes may negatively affect the ability of diabetes patients to access adequate information, use their skills, and think positively.

Limitation

The limitation of this study is that it only represents a certain region because it was planned based on the principle of voluntariness, and that the knowledge level of patients could not be determined using a comprehensive and structured scale. However, this study may be considered to successfully represent the attitudes of Turkish T2DM patients because it included groups from different cultures in three different regions of Turkey. Nevertheless, increasing the number of regions may result in more comprehensive representation of the attitudes of diabetes patients. Considering this fact, this study cannot represent all Turkish diabetes patients. Another limitation is that the study data are limited by the patients with T2DM. Future studies should include Turkish patients with type 1 diabetes.

Conclusion

In general, T2DM patients had a positive attitude towards care and treatment. A holistic approach is important to determine the needs of diabetics. Coexistence of a chronic disease other than diabetes negatively affected the attitudes of the patients. In addition, the duration of diabetes, insulin treatment, and poor health perceptions of the patients were found to be related to a lower level of HbA1c within diabetes patients. Considering that the attitudes of the patients affect holistic care and treatment, the negative attitudes of the patients should be identified and turned into positive ones, positive attitudes should be supported, and training programs should be planned to ensure effective personal management. This can turn negative attitudes into positive ones.

Acknowledgments

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