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Original Article

Evaluation of disease and medication knowledge levels of diabetic patients

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ABSTRACT

Background and Aims: Diabetes mellitus is a public health problem with a significant economic burden to society. Patient attitude is a significant determinant of adherence and clinical outcomes. We aimed to evaluate the disease and medication knowledge level of diabetic patients and possible patient-related predictive factors.

Methods: Adult diabetic patients were included in the study. Patients' demographic and health-related data were collected using a pre-prepared form. Two questionnaires, KAP knowledge tool and Medication Assessment tool were used to assess the disease and medication knowledge levels of patients.

Results: The mean age of 159 patients was 54.44±12.24 years. The disease and medication knowledge scores were high with an average of 13.9±1.74 and 5.26±0.53, respectively. Higher scores were linked to being male ($p=0.042$; $p=0.007$) and higher educational status ($p<0.001$; $p=0.006$). Lower scores were recorded in patients with comorbidities ($p=0.002$; $p<0.001$), older patients ($p<0.001$), longer disease duration ($p<0.001$; $p=0.009$), longer antidiabetic drug use ($p<0.001$; $p=0.009$) and using more drugs ($p=0.002$; $p=0.006$). None of the patients could mention any possible side effects of their medications.

Conclusion: It can be deduced that patient-related factors are significant predictors of patients' disease and medication knowledge. Patient-specific education in addition to rational pharmacological intervention is necessary to achieve better clinical outcomes.

Keywords: Diabetes mellitus, disease knowledge, medication knowledge, patient factors

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INTRODUCTION

Diabetes mellitus is a chronic disease with a high increase in prevalence worldwide. The population of diabetes patients is estimated to reach 578 and 700 million by 2030 and 2045, respectively (Saeedi et al., 2019). The Turkish Diabetes Epidemiology Project (TURDEP) recorded a rise in diabetes prevalence from 7.2% in 1998 to 13.7% in 2010 (Satman et al., 2013). In 2019, Turkey had the highest age-adjusted comparative prevalence (11.1%) of diabetes in the European region and diabetes-related expenditure accounts for 23.8% of the total health expenditure (IDF, 2019). The social and economic burden of the disease cannot be undermined as Turkey is projected to have 10.4 million patients by 2045 (IDF, 2019; Saeedi et al., 2019).

The increase in prevalence is related to the ageing society, urbanization and sedentary lifestyle (Satman et al., 2013). Disease risk can be reduced by taking appropriate precautions and modifying causative factors. Patient education and compliance to treatment are very crucial in providing metabolic control, preventing complications, and improving quality of life.

Several chronic diseases increase the risk of diabetes and vice versa. Hypertension is one of the most common comorbidities present in diabetic patients. Accompanying comorbidities in diabetic patients increase the risk and progression of both macrovascular and microvascular complications of diabetes (American Diabetes Association, 2022). Therefore, educating patients, on the risk of new onset of certain diseases, preventive measures, present comorbidities, and compliance with better management measures, is essential.

One of the main patient factors affecting therapeutic outcomes is adherence. The World Health Organisation defines adherence as "the extent to which a person's behaviour, taking medication, following a diet, and/or executing lifestyle changes, corresponds with agreed recommendations from a health care provider", and it is influenced by multiple factors (Brown and Bussell 2011; Gast and Mathes 2019; WHO, 2003). One of the factors that increases patient adherence, perhaps the most important, is the patient's level of knowledge about the disease and treatment (Albright, Parchman, and Burge 2001). Also, disease knowledge has been shown to affect patient quality of life, and depressive risk has been associated with a low knowledge level (Akin, 2013).

Detailed education on diabetes including probable risks and necessary lifestyle changes is indispensable. Self-care activities such as healthy eating, physical activity, glycemic index calculation, blood glucose monitoring and many more are essential. Patient monitoring by health care providers to assess whether the given information is well understood and applied appropriately is mandatory. Furthermore, updating the knowledge of the diabetic patient at regular intervals and promoting self-care skills are of vital importance in terms of adaptation to the disease (Shrivastava, Shrivastava, and Ramasamy, 2013). Community pharmacists may have an important role to play in this situation as they dispense medications to patients and are the most easily accessible healthcare provider. Their involvement in the care process has been shown to lead to better clinical outcomes and be of economic benefit (Abdulrhim, Sankaralingam, Ibrahim & Awaisu, 2020; Milosavljevic, Aspden, and Harrison 2018; Newman et al., 2020).

Predictive factors can give a better insight into patients' needs from which patient-specific education can be established. This study aimed to evaluate the disease and medication knowledge level of diabetic patients and determine possible predictive factors of patients' knowledge levels.

MATERIALS AND METHODS

This single-centre prospective study was carried out between May-June 2022 in a community pharmacy. Adult diabetic patients using at least one prescribed antidiabetic medication who gave consent were included in the study. Patient demographic and health-related data were collected using a pre-prepared form by a 5th-year pharmacy student. Two questionnaires, 'KAP knowledge questionnaire' (Akin 2013) and 'Medication knowledge evaluation tool' (Okuyan, Sancar, & Izzettin 2013) were used to measure patients' disease and medication knowledge respectively.

The KAP knowledge questionnaire consists of 18 disease-related questions with multiple answer options of which only one is correct. Patients were asked to give the most suitable answer for each question. All correctly answered questions are scored '1', and wrong ones '0', and a total score was obtained for each patient. The Medication knowledge evaluation tool consists of seven open-ended questions. The questions were answered for all dosage forms used by each patient and an average was obtained for each patient. All patients' responses were recorded, and a point was given for each correct response to each question. An additional point was granted to the patients who could state the exact mechanism of action of their medication. The average score of each patient was recorded as their medication knowledge score.

SPSS Version 25.0 was used for statistical analysis. The Kolmogorov-Smirnov test was performed to determine whether the data were parametric. Continuous variables are expressed as mean ± standard deviation; ordinal and nominal data are expressed as n (%). Pearson's correlation analysis was used to analyse the relationship between continuous variables. Mann Whitney U Test was used to determine whether there was a difference between two parametric parameter variables, and Kruskal Wallis-H test was used to determine whether there was a difference between non-parametric variables with multiple subgroups. A p-value < 0.05 within a confidence interval of 95% was considered significant.

This study was approved by Istanbul Medipol University Ethics Committee with decision No:387 (E-10840098-772.02-2721).

RESULTS

A total of 159 patients with an average age of 54,44 participated in the study. The gender distribution of participants was equal (50.1 % female and 49.9% male). The average duration of diabetes disease and duration of treatment were 11.43 years and 11.2 years, respectively. Patients' health and demographic details are given in Table 1. All patients were overweight or

Table 1. Patients' health and demographic data.

Parameters	Mean±SD (range)	n	%
Age (years)	54,44±12,24 (26-83)		
Sex			
Female		81	50,9
Male		78	49,1
Body mass index	29,04±1,30 (26.29-33.59)		
<30		124	78
>30		35	22
Duration of diabetes disease	11,43±8,14 (1-34)		
Duration of antidiabetic drug use	11,2±8,11 (1-34)		
Frequency of daily blood glucose measurement	4,32±1,42 (1-6)		
Patients with comorbidities		91	57,2
Number of comorbidities	0.86±0.9 (0-4)		
Types of comorbid diseases			
Hypertension		64	54.2
Hyperlipidemia		37	31.4
Hypothyroidizm		16	13.6
Heart failure		1	0.8
Educational status			
Primary		24	15,1
Middle school		67	42,1
High school		45	28,3
University/ Post-graduate		23	14,5
Routine doctor visits - Once every			
3 months		19	11,9
6 months		79	49,7
12 months		61	38,4
Dosage forms used	2.59±1.09 (1-5)		
Active agents used	3.09±1.19 (1-6)		
Antidiabetic dosage forms used	1,76±0.76 (1-4)		
Antidiabetic active agents used	2.24±0.96 (1-4)		

obese, and comorbidities were present in 57.2% of the patients. The most common comorbidity was hypertension reported by 64 patients and all patients reported using at least one medication for their comorbidity. A total of 412 drug preparations containing 491 active agents were used by patients. The maximum number of drug preparations used was five, and the maximum number of active agents was six reported by eight and three patients, respectively. The majority (n=116, 73%) of patients were using combination therapy for their diabetes. All patients reported measuring their blood glucose at least once a day with an average of 4.3 measurements/day. Only 19 patients reported visiting their physician at 3-month intervals. The educational status of patients was averagely low with only 14.5% of the patients having a university degree.

Age positively correlates to disease duration ($p<0.001$) and the number of drugs used ($p<0.001$). The frequency of daily glucose management negatively correlates to age ($p=0.021$) and disease duration ($p=0.001$), but positively correlates to the number of antidiabetic medications used ($p=0.025$). There was a positive correlation between the number of drugs used and disease duration ($p=0.001$) and the number of antidiabetic medications used ($p<0.001$).

Disease knowledge scores

The average disease knowledge score was 13.9 ± 1.74. The minimum score was 7 obtained by one patient, and the maximum score was 17 obtained by 4 patients (Table 2). All patients were able to correctly answer four questions which include "The most accurate method of monitoring diabetes is..."; "The important factors that help in controlling blood sugar are…."; "Treatment of diabetes comprises....."; and "For proper foot care, a diabetic patient.... ". On the contrary, the questions "In a diabetic patient, high blood pressure can increase or worsen...." and " A diabetic patient should measure his or her blood pressure...." were only answered correctly by five and 32 patients, respectively.

Medication knowledge scores

A total of 412 questionnaires were completed. The distribution of patients' responses to the questions is given in Table 3. The general scores of patients were high. All patients expressed knowing how to use their drugs and when to take them, but none of them knew the possible side effects of their medications. The average score was 5.26 ± 0.53. The minimum score was 4 obtained by 5 patients, and the maximum score was 6 obtained by 47 patients.

Predictors of patients' disease and medication knowledge scores

There was a positive correlation between the disease and medication knowledge scores ($r=0.268$; $p=0.001$). The disease and medication knowledge scores were negatively correlated to age ($p<0.001$), disease duration ($p<0.001$; $p=0.009$); and the number of dosage forms used ($p=0.002$; $p=0.006$). While medication knowledge score was positively correlated to the frequency of blood glucose monitoring ($p<0.001$), there was no relevant correlation between knowledge scores and other patient parameters. Details are given in Table 4.

Table 2. Response to disease knowledge questions.

Questions	Patients who answered correctly n (%)	
Diabetes is a condition in which the body contains...	87	(54.7)
The major cause of diabetes is.....	95	(59.7)
The symptom(s) of diabetes is/are.....	76	(47.8)
Diabetes, if not treated.....	148	(93.1)
The most accurate method of monitoring diabetes is...	159	(100.0)
In a diabetic patient, high blood pressure can increase or worsen....	5	(3.1)
A diabetic patient should measure his or her blood pressure.....	32	(20.1)
The lifestyle modification(s) required for diabetic patients is/are.....	146	(91.8)
A diabetic patient should have his or her eyes checked....	101	(63.5)
The important factors that help in controlling blood sugar are	159	(100.0)
Treatment of diabetes comprises.....	159	(100.0)
Diabetes cannot be treated with.....	153	(96.2)
Upon control of diabetes, the medicines.....	159	(100.0)
How do you manage hypoglycemic symptoms.....?	149	(93.7)
Regular urine tests will help in knowing.....	136	(85.5)
A regular exercise regimen will help in.....	133	(83.6)
The well-balanced diet includes.....	154	(96.9)
For proper foot care, a diabetic patient.....	159	(100.0)

Table 3. Response to the Medication knowledge evaluation tool.

Questions	n	%
Can you list the names of all medications you are currently taking?	155	97.5
Can you tell me why you are taking this medication?	158	99.4
Do you know how to take your medicine?	159	100.0
Do you know when to take your medicine?	159	100.0
Do you know the possible side effects of your medicine?	0	0
Do you know what to do if your medication's side effects occur?	142	89.3
Do you know what to do if you miss a dose of your medicine?	108	67.9

Table 4. Correlation between knowledge scores and patient parameters.

	Disease knowledge score		Medication knowledge score	
Patient parameter	**r**	**p**	**r**	**p**
Age	-0.591	<0.001**	-0.314	<0.001**
Body mass index	0.146	0.066	0.02	0.803
Duration of diabetes disease	-0.509	<0.001**	-0.207	0.009**
Duration of antidiabetic drug use	-0.513	<0.001**	-0.206	0.009**
Daily glucose monitoring	0.146	0.066	0.293	<0.001**
Number of drugs used	-0.240	0.002**	-0.215	0.006**
Number of antidiabetic drug used	-0.01	0.898	0.054	0.498

Pearson's correlation, p<0.05 indicates statistical significance

Higher disease knowledge scores were recorded for male patients (p=0.042) and in more educated patients (p<0.001). Medication knowledge scores were positively correlated to being male (p=0.007), having higher education (p=0.006) and having fewer doctor visitations (p=0.036). The presence of co-morbidity was associated with lower disease (p=0.006) and medication knowledge (p<0.001). As seen in Table 5, the general knowledge of patients with only primary education was significantly low compared to the other groups, while only the medication knowledge scores of patients that visited the doctor every 3 months were significantly lower than the other two groups. There was a significant difference between these patient groups. The frequency of doctors' visits was associated with having more comorbidities (p<0.001) and medications (p<0.01).

DISCUSSION

Complete patient compliance is required in chronic diseases like diabetes to achieve disease control. Disease and medication knowledge of patients affect their adherence and attitude towards medications and self-care practices. Better glycaemic control is achieved in more knowledgeable patients (Bukhsh

Table 5. Association between knowledge scores and patient parameters.

Patient parameter		N	Disease knowledge score		Medication knowledge score	
			Median (IQR)	p	Median (IQR)	p
Sex[a]	Female	81	14 (2)	0.042*	5 (0.4)	0.007*
	Male	78	15 (2)		5 (1)	
Presence of comorbidities[a]	Yes	91	14 (3)	0.002*	5 (0)	<0.001*
	No	68	15 (2)		5 (1)	
Educational status[b]	Primary	24	11 (3)	<0.001*	5 (0)	0.006*
	Middle school	67	14 (2)		5 (0.6)	
	High school	45	15 (2)		5 (1)	
	University graduate	23	15 (1)		5 (1)	
Routine doctor visits - Once every[b]	3 months	19	14 (2)	0.078	5 (0.2)	0.036*
	6 months	79	14 (2)		5 (1)	
	12 months	61	15 (2)		5 (1)	

[a]Mann-Whitney Test; [b]Kruskal-Wallis Test; p<0.05 *indicates statistical significance

et al. 2019). In this study, the disease and medication awareness of patients and patient-related predictive factors were assessed. The participants were averagely young, which implies a high incidence of early-onset diabetes. Also, age was significantly correlated to the duration of disease, which implies even older patients were diagnosed at an early age. A similar age average was reported in previous studies (Bukhsh et al., 2019; Okuyan, et al., 2013; Quinton, Lewis, Ali, Morgan, & Bertelli, 2013). A significant increase in the incidence of diabetes and impaired glucose tolerance in the 20-40 age group was previously reported in the TURDEP-II Study (Satman et al., 2013), and this increase is attributed to the increase in the incidence of obesity which is a known risk factor for diabetes (American Diabetes Association, 2022). The body mass index of all the patients was above normal with an average of 29.04 kg/m^2, and 35 patients were obese. The presence of comorbid diseases was also high in the participants. Hypertension and hyperlipidaemia were the most recorded comorbidities. These two diseases are common among diabetic patients (American Diabetes Association 2022). The number of medications used increases with comorbidities. Although the average number of drugs used was relatively low, 66 patients were using at least three antidiabetic medications. The gender distribution of the study population was relatively equal as there were only three more female patients than males. Epidemiology studies in Turkey have shown a higher prevalence of diabetes among female patients (Satman et al., 2013).

The disease knowledge of our patients was relatively high as the scores of 105 patients were above average. This was reflected in patients' attitudes towards daily blood glucose monitoring. Similar results were reported in a recent study (Muhammad Haskani et al., 2022). Self-care activities have been associated with higher knowledge (Bukhsh et al., 2019). However, more frequent doctor visits were reported by less knowledgeable patients. These patients had more comorbid diseases and more medications. Unfortunately, most patients lacked knowledge of the risks of the comorbidities on their prognosis, which is an important issue. A multidisciplinary approach to patients especially when there are comorbidities is essential in the effective rational management of all diseases. Education must be personalised to encompass all aspects of a patient's particular needs.

Male patients had more disease knowledge than their female counterparts. Although some studies have found gender-related differences in disease knowledge (Bukhsh et al., 2019), Sweileh et al. reported that sex did not affect disease knowledge in their study (Sweileh et al., 2014). The knowledge level increased with educational status, as reported in other studies (Akin 2013; Al-Adsani, Moussa, Al-Jasem, Abdella, & Al-Hamad, 2009; Bukhsh et al., 2019; Guler and Oguz 2011). Correspondingly, educational status was shown to be a significant predictor of self-care practices (Bukhsh et al., 2018). The disease knowledge of patients significantly dropped with age. The decrease in knowledge level in older patients has been reported in other studies (Al-Adsani et al., 2009; Guler and Oguz 2011; He & Wharrad 2007). Correspondingly patients with longer disease duration had lower disease knowledge scores.

The average medication knowledge level of patients was relatively high in contrast to a recent study which used the same measurement tool as ours (Muhammad Haskani et al., 2022). Higher scores were associated with being male, absence of comorbidities, higher educational status, and more frequent doctor visits. We recorded lower scores in older patients, who have longer disease duration and use more medications. Okuyan et al. reported higher scores in female patients and younger patients (Okuyan et al., 2013). In their study, they calculated the medication knowledge score for a randomly picked drug for

each patient while we calculated the average score of medication knowledge of all drugs for each patient.

Although average medication knowledge was high, no patient could mention any possible side effects of their medications as similarly reported in another study (Muhammad Haskani et al., 2022). Medication-related side effects like hypoglycaemia are common with antidiabetic medication. These side effects may have detrimental consequences. Good communication between healthcare professionals and patients is important to reduce medication-related mortality and morbidity risk (American Diabetes Association, 2022). Patient awareness of self-manageable side effects and the side effects that need emergency attention are necessary. Patients must be educated on necessary self-management strategies.

Community pharmacists have an important role to play as the most easily accessible healthcare providers. Community pharmacist-led interventions have been shown to improve clinical outcomes in the management of diabetic patients (Korcegez, Sancar, & Demirkan, 2017). Involvement of pharmacies in patient education especially in medication-related issues will improve patient knowledge, clinical outcome, rational drug use and thus economic outcomes.

Study Limitations

The study was carried out in one-centre, which limited the number of patients and the socioeconomic diversity of patients. We also could not measure the effect of knowledge level on patient adherence and prognosis as the duration of the study was limited.

CONCLUSION

From this study, it can be deduced that patient-related factors are significant predictors of patients' disease and medication knowledge. Less knowledge was linked with older age, presence of comorbidities, number of drugs used, longer disease duration and antidiabetic drug use. Patient-specific education and training in addition to rational pharmacological intervention are necessary to achieve better clinical outcomes.

Informed Consent: Written consent was obtained from the participants.

Peer-review: Externally peer-reviewed.

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