

# Relationship between patient satisfactions with diabetes care and treatment

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## Abstract

**Background:** Measurement of treatment satisfaction in diabetes is important as it has been shown to be associated with positive outcomes, reduced disease cost and better health.

**Aim:** The aim of this study was to assess the relationship between treatment satisfaction of diabetes patients and socioeconomic, clinical, medication adherence and health-related factors in Qatar.

**Design:** This is a cross-sectional study.

**Setting:** The survey was carried out in primary health care centers and hospitals from April 2010 to May 2011.

**Subjects:** Of a total of 3000 diabetic patients, 2582 patients gave their consent to take part in the study, with a response rate of 86.1%.

**Materials and Methods:** The Diabetes Treatment Satisfaction Questionnaire was used to measure the patient satisfaction. The modified Morisky Medication Adherence was used to measure medication taking behavior. A multivariate stepwise linear regression model was performed to identify factors independently associated with patients' satisfaction instrument.

**Results:** Of the studied patients, majority of the diabetes patients were Qataris (61.2%), married (86.1%), above secondary education (46.9%) and unemployed (28.6%). Diabetes patients who had professional jobs ( $3.97 \pm 0.65$ ;  $P = 0.009$ ) and those who were staying alone had a significantly higher treatment satisfaction score ( $4.01 \pm 0.64$ ;  $P = 0.001$ ) compared with the other patients. Patients who were taking tablets were significantly more satisfied with treatment ( $4.08 \pm 0.60$ ;  $P < 0.001$ ). Diabetes patients of primary health care centers (3.96 vs. 3.80;  $P < 0.001$ ) were more satisfied with treatment than patients visiting hospitals. Multivariate regression analysis revealed that age of the patient ( $P < 0.001$ ), expatriates ( $P = 0.023$ ), patients visiting hospitals ( $P < 0.001$ ), treatment with insulin ( $P < 0.001$ ) and any diabetes complications ( $P < 0.001$ ) were significantly less satisfied with the treatment.

**Conclusion:** The study findings revealed that patient satisfaction was positively associated with sociodemographic variables like high income, employment, married individuals and those with higher levels of education. We found a lower treatment satisfaction in patients with diabetes-related complications and insulin treatment.

**Key words:** Diabetes care, DTSQ, health status, patient satisfaction, quality of life, treatment adherence

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## Introduction

Diabetes mellitus (DM) is one of the major non-communicable diseases with a dramatically increasing prevalence in both

the developed and the developing world.<sup>[1]</sup> In recent times, the Middle East region has seen some of the largest growth

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in DM in the world; five out of the top 10 countries with the highest diabetes prevalence are in the Middle East region, and trends predict that the region will see over 90% growth in the disease by 2030.<sup>[1-3]</sup> These perturbing trends are a result of the dramatic changes in dietary and lifestyle habits in this rapidly economically developing region.<sup>[4]</sup> In line with global trends, the most sociodemographically vulnerable populations in the region have been found to be the main victims of the diabetes epidemic, namely those of lower socioeconomic status (SES), females and the elderly.<sup>[5-8]</sup>

DM also has a more detrimental impact on females' psychological well-being.<sup>[7-9]</sup> A 5 years cohort study among Qatari patients with DM reported that females found it more difficult to cope with DM and reported worse "Quality of Life" in comparison with males.<sup>[7]</sup> Another Swedish study conducted among Type 2 diabetes mellitus (T2DM) primary health care patients documented similar gender results, and reported glycosylated hemoglobin (HbA1c) as the most important factor associated with coping strategies.<sup>[10]</sup> A more recent study in Israel<sup>[5]</sup> showed that lower treatment satisfaction is related to difficulties in adherence to taking medications and attending follow-up clinic visits, treatment with insulin or oral medications, any diabetes complication, being female and having had less than 6 years of education. Several studies have evaluated the relationship of diabetic treatment satisfaction with different treatment modalities, its quality, patients' quality of life, and clinical outcome.<sup>[5,11-13]</sup>

Patients are inclined to make the best of their current treatment and only become aware of its drawbacks when they can compare it with something better.<sup>[9]</sup> A frequently observed feature in trials of new treatments for diabetes is therefore a relatively high level of patient satisfaction with pre-trial treatment.<sup>[7,10-15]</sup> Patient satisfaction surveys produce little variation and most respondents express positive satisfaction.<sup>[6]</sup> Researchers evaluating diabetes treatment interventions have commonly used the Diabetes Treatment Satisfaction Questionnaire (DTSQ) in its original "status" form.<sup>[7,10-15]</sup> Treatment satisfaction is an important fact of quality of care, especially in treating chronic diseases such as DM.<sup>[5]</sup> Identifying factors that independently influence treatment satisfaction may help in improving clinical outcomes.

The aim of this study was to determine the association between treatment satisfaction of diabetes patients and socioeconomic, medication adherence and clinical outcome in a community-based sample of diabetes patients in Qatar.

## Materials and Methods

This is a cross-sectional study that was conducted among the diabetic patients registered in diabetic clinics of primary health care (PHC) centers and outpatient clinics of the

hospitals. The diabetes care is organized in most of the PHC centers. During the study period from April 2010 to May 2011, the study included the diabetic patients registered in these diabetic clinics. From the patients diagnosed with diabetes in hospitals and PHCs, we have approached 3000 diabetic patients, of whom 2582 agreed and gave their consent to take part in this study thus giving a response rate of 86.1%. Institutional Review Board ethical approval for this study was obtained from the Hamad Medical Corporation prior to commencing data collection.

### Questionnaire

We have developed a structured questionnaire consisting of questions relating to sociodemographic data, treatment modality, symptoms of diabetes, diabetic complications and place of diabetic treatment. The second section included items about laboratory investigations such as blood glucose, HbA1C, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) cholesterol levels and triglyceride. The third section is the DTSQ<sup>[13]</sup> consisting of eight questions concerning the treatment for diabetes and experience over the past few weeks. The fourth section is the Modified Morisky Medication Adherence questionnaire concerning the questions related to issues of medication taking behavior. The fifth section included items concerning mode of treatment, symptoms of diabetes and complications after the onset of diabetes.

### Diabetes treatment satisfaction questionnaire

The DTSQ was developed from the widely used and recommended DTSQs<sup>[9,13-15]</sup> available in a wide range of languages,<sup>[16,17]</sup> the development of which is reported in detail elsewhere.<sup>[13,14]</sup> Both forms of the DTSQ are suitable for use by people with type 1 or type 2 diabetes. The DTSQ contains eight items scored on six-point scales. Six items (Qs. 1 and 4-8) measure treatment satisfaction (dealing with: Satisfaction with current treatment; convenience of the treatment; flexibility; satisfaction with own understanding of their diabetes; how likely to recommend their present treatment; and how satisfied to continue with their present treatment). These are summed to produce a total Treatment Satisfaction score. Questions 2 and 3, concerning the level of blood sugar, are treated separately from the satisfaction items and from each other.<sup>[13-15]</sup> On these two items, low scores represent good perceived blood glucose control. The important differences lie in the wording of the response options and instructions, which, in the DTSQ, direct the respondent to compare their experience of the current treatment with their experience of treatment before the study began. DTSQs scores range from, for example, 6 = *very satisfied* to 0 = *very dissatisfied*.

### Modified morisky medication adherence scale

The modified Morisky Medication Adherence Scale (MMAS-8) is an eight-item self-report measure of adherence<sup>[18]</sup>. The single composite measure was scored

according to the developers' instructions so that higher scores indicate higher adherence. Individuals have identified several issues regarding their medication taking behavior. Each question was based on their personal experience with the medication taking behavior. The first seven questions are scored with "yes = 1" and "No = 0." Question 8 concerning the difficulty to remember taking medications is scored "Never/Rarely = 0," "Once in a while = 1," "sometimes = 2," "usually = 3" and "all the time = 4."

### Anthropometric examination and measurements

Anthropometric examination and measurements were performed by a trained nurse. Height was measured in centimeters using a height scale (SECA, Germany) while the subject was standing bare feet and with normal straight posture. Weight was measured in kilograms using a weight scale (SECA). Body Mass Index (BMI) was calculated as the ratio of weight (kg) to the square of height (m). A person was considered obese if the BMI value was  $\geq 30$  kg/m<sup>2</sup>, overweight if BMI  $> 25$  kg/m<sup>2</sup> and  $< 30$  kg/m<sup>2</sup>.

### Laboratory measurements and diabetes diagnosis

Oral Glucose Tolerance Test (OGTT): A 75 gm OGTT was performed after 10 h overnight fast and the plasma glucose concentration was measured before and 2 h after the glucose drink. HbA1C was analyzed using a high-performance liquid chromatography (HPLC) method. The diagnosis of T2DM was performed according to the ADA criteria, i.e., (1) fasting venous plasma glucose concentration  $\geq 7.0$  mmol/L, (2) 2-h venous plasma glucose concentration  $\geq 11.1$  mmol/L or (3) HbA1c  $\geq 6.5\%$ . Subjects reporting a history of DM and receiving antihyperglycemic therapy were also considered as having DM. Information about lipid profile (total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides) was collected from the medical records.

### Diabetes symptoms and complications

The PHC department and outpatient clinics of the hospitals have their own medical record sections and they are responsible for the files of their patients. Family physicians and research nurses reviewed the medical files of diabetic patients in both the settings and recorded all the required clinical variables of this study. Research nurses have collected diabetic complications like retinopathy, neuropathy, nephropathy and diabetic foot ulcer from the medical records of the patients.

The questionnaire and criteria for relationship between patient satisfaction with diabetes care and treatment were defined and developed by the primary investigator. A translated Arabic version of the designed questionnaire was revised by a bilingual consultant. The qualified nurses, who were fluent in Arabic language, performed face-to-face interview with the patients. They have completed the designed questionnaires interviewing the participants and some of the clinical information was recorded from the

medical records of the patients. The designed questionnaire was tested among 100 patients as a pilot study for the validity of the questionnaire. The investigators have made the necessary corrections and modifications after considering the minor differences and discrepancies that have been found during the pilot study.

Student's *t*-test was used to ascertain the significance of differences between the mean values of two continuous variables and confirmed by the non-parametric Mann-Whitney test. One-way ANOVA with *post hoc* pairwise comparison through least significant difference LSD was used to ascertain the significance of the difference between the mean values of more than two continuous variables. Chi-square and Fisher exact tests were performed to test for differences in proportions of categorical variables between two or more groups. A multivariate linear regression model with stepwise elimination was constructed to identify the determinants of diabetes treatment satisfaction while adjusting for the potential confounders. The level  $P < 0.05$  was considered as the cut-off value for significance.

## Results

Table 1 shows the sociodemographic and clinical characteristics of the studied diabetes patients according to gender. Majority of the diabetic patients (30.8%) were in the age group of 50-59 years with a significant difference ( $P = 0.001$ ). Most of the patients were Qataris (61.2%), married (86.1%), with secondary education (27.9%) and unemployed (28.6%) and 60.3% had high-level income ( $> \$3,000$ ). Diabetes complications of nephropathy (10.9% vs. 8.5%;  $P = 0.034$ ) and neuropathy (14.6% vs. 10.7%;  $P = 0.003$ ) were significantly higher in diabetic men compared with women, whereas retinopathy was significantly higher in women (20.1% vs. 16.8%;  $P = 0.032$ ) than in men.

Table 2 reveals the relationship between treatment satisfaction and sociodemographic characteristics of the studied diabetes patients. The overall mean score of treatment satisfaction was  $3.91 \pm 0.64$ . Diabetes patients who had professional jobs ( $3.97 \pm 0.65$ ;  $P = 0.009$ ) and those who were staying alone had a significantly higher satisfaction score ( $4.01 \pm 0.64$ ;  $P = 0.001$ ) compared with their counterparts. Satisfaction scores of diabetic patients who had university education ( $3.93 \pm 0.67$ ) and average income of \$3000 or above ( $3.92 \pm 0.62$ ) were slightly higher than their counterparts, but the difference was not statistically significant.

Table 3 shows the relationship between treatment satisfaction and diabetes treatment modalities and diabetic complications in diabetic patients. In treatment modality, patients who were taking tablets were significantly more satisfied with the treatment of diabetes ( $4.08 \pm 0.60$ ;

**Table 1: Sociodemographic and clinical characteristics of the studied diabetic patients according to gender (n=2582)**

	Total N (%)	Male, n=1297 (%)	Female, n=1285 (%)	P value
Duration of diabetes in years (mean ±SD)	7.69±5.1	7.59±5.4	7.78±4.6	0.366
Age (in years)				
<30	212 (8.2)	92 (7.1)	120 (9.3)	0.001
30-39	304 (11.8)	168 (13.0)	136 (10.6)	
40-49	627 (24.3)	292 (22.5)	335 (26.1)	
50-59	794 (30.8)	438 (33.8)	356 (27.7)	
60 and above	645 (25.0)	307 (23.7)	338 (26.3)	
Nationality				
Qatari	1580 (61.2)	624 (48.1)	956 (74.4)	<0.001
Non-Qatari	1002 (38.8)	673 (51.9)	329 (25.6)	
Marital status				
Single	173 (6.7)	83 (6.4)	90 (7.0)	<0.001
Married	2223 (86.1)	1161 (89.5)	1062 (82.6)	
Divorced/widow	186 (7.2)	53 (4.1)	133 (10.3)	
BMI				
Normal<25	717 (27.8)	417 (32.2)	300 (23.3)	<0.001
Overweight (25-29.9)	1189 (46.0)	582 (44.9)	607 (47.2)	
Obese (30 and above)	676 (26.2)	298 (23.0)	378 (29.4)	
Consanguinity				
Yes	981 (38.0)	524 (40.4)	457 (35.6)	0.011
No	1601 (62.0)	773 (59.6)	828 (64.4)	
Level of education				
Illiterate	420 (16.3)	188 (14.5)	232 (18.1)	0.002
Primary	435 (16.8)	225 (17.3)	210 (16.3)	
Intermediate	517 (20.0)	267 (20.6)	250 (19.5)	
Secondary	720 (27.9)	339 (26.1)	381 (29.6)	
University	490 (19.0)	278 (21.4)	212 (16.5)	
Occupation				
Housewife/unemployed	738 (28.6)	83 (6.4)	655 (51.0)	<0.001
Sedentary/professional	650 (25.2)	400 (30.8)	250 (19.5)	
Clerk	586 (22.7)	416 (32.1)	170 (13.2)	
Businessmen	245 (9.5)	162 (12.5)	83 (6.5)	
Army/police	203 (7.9)	121 (9.3)	82 (6.4)	
Manual	160 (6.2)	115 (8.9)	45 (3.5)	
Household income (\$ US) per month				
<\$3000	1026 (39.7)	493 (38.0)	533 (41.5)	0.072
≥\$3000	1556 (60.3)	804 (62.0)	752 (58.5)	
Current level of HbA1c (mean±SD)	9.15±14.1	8.39±2.1	8.56±2.0	0.075
Diabetes complications				
Retinopathy	476 (18.4)	218 (16.8)	258 (20.1)	0.032
Nephropathy	251 (9.7)	142 (10.9)	109 (8.5)	0.034
Neuropathy	326 (12.6)	189 (14.6)	137 (10.7)	0.003
Antipathy	164 (6.4)	78 (6.0)	86 (6.7)	0.480
Diabetic foot ulcer	299 (11.6)	154 (11.9)	145 (11.3)	0.640

DTSQ=Diabetes treatment satisfaction questionnaire (scale ranging from 0=lowest to 6=highest)

$P < 0.001$ ). Diabetic patients visiting PHCs ( $3.96 \pm 0.60$ ) were significantly more satisfied with treatment than patients visiting hospitals ( $3.80 \pm 0.71$ ) ( $P < 0.001$ ).

**Table 2: Relationship between treatment satisfaction and sociodemographic characteristics of diabetic patients (n=2582)**

Variables	Mean DTSQ score ±SD	P value
Mean score of treatment satisfaction (overall)	3.91±0.64	
Age (in years)		
<30	3.95±0.64	0.012
30-39	3.84±0.68	
40-49	3.98±0.64 <sup>a</sup>	
50-59	3.88±0.62	
60 and above	3.88±0.65	
Gender		
Male	3.92±0.62	0.291
Female	3.90±0.66	
Nationality		
Qatari	3.92±0.66	0.105
Non-Qatari	3.88±0.62	
Family status		
Single (alone)*	4.01±0.64	0.001
Married	3.89±0.64	
Level of education		
Illiterate	3.89±0.67	0.599
≤Secondary	3.91±0.62	
University	3.93±0.67	
Occupation		
Housewife/unemployed	3.86±0.66 <sup>b</sup>	0.009
Professional	3.97±0.65	
Clerk/manual, etc.	3.92±0.61	
Businessmen	3.86±0.67 <sup>b</sup>	
Household income (\$US)		
<\$3000	3.89±0.64	0.470
≥\$3000	3.92±0.62	

DTSQ=Diabetes treatment satisfaction questionnaire (scale ranging from 0=lowest to 6=highest). <sup>a</sup>Significantly different from groups 2, 4 and 5. <sup>b</sup>Significantly different from group 2. <sup>c</sup>Significantly different from groups 1 and 3. <sup>d</sup>Significantly different from groups 2 and 6. <sup>e</sup>Significantly different from groups 1 and 4

Table 4 presents the relationship between treatment satisfaction of patients with their laboratory investigations. Patients who had optimum level in their lab investigations were significantly more satisfied with the treatment; fasting blood glucose ( $3.94 \pm 0.65$  vs.  $3.87 \pm 0.63$ ;  $P = 0.007$ ), HbA1C ( $4.1 \pm 0.49$  vs.  $3.85 \pm 0.66$ ;  $P = 0.023$ ), total cholesterol level ( $4.02 \pm 0.53$  vs.  $3.76 \pm 0.59$ ;  $P = 0.001$ ), triglycerides ( $3.90 \pm 0.67$  vs.  $3.84 \pm 0.62$ ;  $P = 0.035$ ), HDL ( $3.92 \pm 0.64$  vs.  $3.86 \pm 0.57$ ;  $P = 0.045$ ) and LDL ( $3.96 \pm 0.65$  vs.  $3.90 \pm 0.59$ ;  $P = 0.021$ ).

Table 5 shows the medication taking behaviors of the studied diabetic patients according to gender. Majority of the diabetic men (89.8%) and women (89.4%) did not forget to take their medicines, while a good proportion of diabetic men (17.3%) and women (18.7%) stopped taking medication without the knowledge of their doctors. Also, nearly one-fourth of the diabetic men (21.6%) and

**Table 3: Relationship between treatment satisfaction and diabetes treatment modalities and diabetes complications in diabetic patients (n=2582)**

	Mean DTSQ score $\pm$ SD	P value
<b>Treatment modality</b>		
None (n=523)	3.86 $\pm$ 0.69	<0.001
Diet modification (n=501)	3.89 $\pm$ 0.63	
Tablets (n=580)	4.08 $\pm$ 0.60*	
Insulin (n=588)	3.84 $\pm$ 0.61	
Insulin + tablets (n=390)	3.85 $\pm$ 0.62	
<b>Diabetic complications</b>		
<b>Retinopathy</b>		
Yes (n=476)	3.87 $\pm$ 0.69	0.179
No (n=2106)	3.92 $\pm$ 0.63	
<b>Neuropathy</b>		
Yes (n=326)	3.98 $\pm$ 0.61	0.040
No (n=2256)	3.90 $\pm$ 0.64	
<b>Nephropathy</b>		
Yes (n=251)	3.89 $\pm$ 0.62	0.695
No (n=2331)	3.91 $\pm$ 0.64	
<b>Diabetic foot ulcer</b>		
Yes (n=299)	4.05 $\pm$ 0.49	<0.001
No (n=2283)	3.89 $\pm$ 0.65	
<b>Antipathy</b>		
Yes (n=164)	3.86 $\pm$ 0.68	0.314
No (n=2418)	3.91 $\pm$ 0.64	
<b>Place of diabetic treatment</b>		
Primary health care (n=1768)	3.96 $\pm$ 0.60	<0.001
Hospital (n=814)	3.80 $\pm$ 0.71	
<b>Diabetic education</b>		
Yes (n=1946)	3.92 $\pm$ 0.65	0.312
No (n=636)	3.89 $\pm$ 0.61	

DTSQ=Diabetes treatment satisfaction questionnaire (scale ranging from 0=lowest to 6=highest) \*Significantly different from all others

women (23%) stopped taking medicines when they found that their health status improved.

Table 6 shows the multiple linear regression analysis examining the relation between all statistically significant parameters and DTSQ scores. The data revealed that the satisfaction score for expatriate patients (Adj.  $\beta$  -0.47,  $P = 0.023$ ) was lower than that for Qataris. Also, satisfaction score for patients receiving care from hospital was 1.41-times lower than those receiving care from PHCs (Adj.  $\beta$  -1.41,  $P < 0.001$ ). No diabetes complication (Adj.  $\beta$  1.86,  $P < 0.001$ ) and treatment with tablets (Adj.  $\beta$  1.62,  $P < 0.001$ ) were significantly associated with higher treatment satisfaction.

## Discussion

Patient satisfaction is considered as a main component of the quality of medical care. Hence, determining the patient satisfaction level is an important way of improving health care. The authors of the current study took the initiative to conduct this large study surveying 2582 diabetes patients in

**Table 4: Relationship between treatment satisfaction and laboratory investigations among diabetic patients (n=2582)**

	Mean DTSQ score $\pm$ SD	P value
<b>Fasting blood glucose</b>		
Optimum (<7.0 mmol/L)	3.94 $\pm$ 0.65	0.007
High ( $\geq$ 7.0 mmol/L)	3.87 $\pm$ 0.63	
<b>HbA1C levels</b>		
Optimum (<6.5)	4.10 $\pm$ 0.49	0.023
High ( $\geq$ 6.5)	3.85 $\pm$ 0.66	
<b>Total cholesterol level</b>		
Optimum (<5.17)	4.02 $\pm$ 0.53	0.001
Borderline and high ( $\geq$ 5.17)	3.76 $\pm$ 0.59	
<b>Triglycerides level</b>		
Optimum (<1.7)	3.90 $\pm$ 0.67	0.035
Borderline and high ( $\geq$ 1.7)	3.84 $\pm$ 0.62	
<b>HDL cholesterol</b>		
Low (<1.0)	3.92 $\pm$ 0.64	0.045
Desirable ( $\geq$ 1.0)	3.86 $\pm$ 0.57	
<b>LDL cholesterol</b>		
Optimum (<3.36)	3.96 $\pm$ 0.65	0.021
Borderline and high ( $\geq$ 3.36)	3.90 $\pm$ 0.59	

DTSQ=Diabetes treatment satisfaction questionnaire (0=lowest, 6=highest)

Qatar to evaluate their treatment satisfaction. This is the first study conducted in Qatar to investigate the relationship between treatment satisfaction and sociodemographic characteristics, treatment modalities, diabetic complications and medication taking behaviors in diabetic patients. The DTSQ, which was used to evaluate the satisfaction score, rated a mean score of 3.8 to 4 in all parameters of diabetic patients, which shows that diabetes patients rated a higher degree of satisfaction. The overall mean score of treatment satisfaction was  $3.91 \pm 0.64$ .

As for treatment satisfaction in the study sample, a number of sociodemographic variables were associated with satisfaction score. Diabetic men (mean score of 3.92) were more satisfied with treatment than women (mean score of 3.90), which is consistent with the findings in Sweden<sup>[19]</sup> and Italy.<sup>[20]</sup> Diabetic patients who were staying alone ( $4.01 \pm 0.64$ ;  $P = 0.001$ ) and had professional jobs ( $3.97 \pm 0.65$ ;  $P = 0.009$ ) were significantly more satisfied with treatment than their counterparts. Another study by Biderman *et al.*<sup>[5]</sup> also observed similar results, wherein married patients were less satisfied with treatment than unmarried patients. In the study sample of diabetes patients, highly educated patients ( $3.93 \pm 0.67$ ) and professionals ( $3.97 \pm 0.65$ ;  $P = 0.009$ ) had a higher satisfaction score compared with other patients, which is in line with another study<sup>[19]</sup> that reported that less-educated patients were less satisfied with diabetes treatment. Age of the diabetic patients was a contradicting factor in the current study, wherein it was shown that younger patients were more satisfied with treatment. In other studies,<sup>[11]</sup>

**Table 5: Medication taking behaviors\* of the studied diabetic patients according to gender (n=2582)**

	Male, n=1297 (%)	Female, n=1285 (%)	P value
Do you sometimes forget to take medicine?			
Yes	132 (10.2)	136 (10.6)	0.735
No	1165 (89.8)	1149 (89.4)	
People sometimes miss taking their medications for reasons other than forgetting. Thinking over the past two weeks, were there any days when you did not take your medicine?			
Yes	45 (3.5)	60 (4.7)	0.123
No	1252 (96.5)	1225 (95.3)	
Have you ever cut back or stopped taking your medication without telling your doctor, because you felt worse when you took it?			
Yes	224 (17.3)	240 (18.7)	0.352
No	1073 (82.7)	1045 (81.3)	
When you travel or leave home, do you sometimes forget to bring along your medication?			
Yes	110 (8.5)	97 (7.5)	0.383
No	1187 (91.5)	1188 (92.5)	
Did you take your medicine daily?			
Yes	1220 (94.1)	1186 (92.3)	0.075
No	77 (5.9)	99 (7.7)	
When you feel like your health concern is under control, do you sometimes stop taking your medicine?			
Yes	280 (21.6)	296 (23.0)	0.377
No	1017 (78.4)	989 (77.0)	
Taking medication everyday is a real inconvenience for some people. Do you ever feel hassled about sticking to your blood pressure treatment plan?			
Yes	105 (8.1)	116 (9.0)	0.398
No	1192 (91.9)	1169 (91.0)	
How often do you have difficulty remembering to take all your medications?			
Never/rarely	836 (64.5)	820 (63.8)	<0.001
Once in a while	122 (9.4)	181 (14.1)	
Sometimes	148 (11.4)	108 (8.4)	
Usually	125 (9.6)	83 (6.5)	
All the time	66 (5.1)	93 (7.2)	

\*Modified morisky scale. P values based on the Chi square-test of significance

**Table 6: Multivariable linear regression for the association between treatment satisfaction and sociodemographic, clinical parameters, diabetic complications and treatment factors (n=2582)**

Parameter	Adj. $\beta$ (95% CI)	P value
Age (in years)	-0.03 (-0.04, -0.01)	<0.001
Nationality (non-Qatari vs. Qatari)	-0.47 (-0.87, -0.06)	0.023
Treatment center (hospital vs. PHC)	-1.41 (-1.84, -0.97)	<0.001
Current treatment (tablets vs. any other treatment)	1.62 (1.16, 2.09)	<0.001
Diabetes complication (none versus any)	1.86 (1.38, 3.73)	<0.001

Coefficient of correlation ( $r=0.20$ ), coefficient of determination ( $r^2=0.04$ ). Dependent variable: Treatment satisfaction score (range 0-48)

it was observed that younger patients were less satisfied with treatment. In the study sample of diabetic patients, satisfaction was positively associated with higher income, employment and higher educational level, as observed in other studies.<sup>[19-21]</sup> These study findings show that patients' satisfaction with diabetes treatment was influenced by their

sociodemographic characteristics.

Regarding the treatment modality, patients who were taking tablets ( $4.08 \pm 0.60$ ;  $P < 0.001$ ) had higher satisfaction scores, with a significant difference with other treatments. Similar to other studies,<sup>[19]</sup> insulin users of this study sample had a lower satisfaction score than those who were receiving other medications. This shows that taking a pill is more comfortable for diabetes patients rather injecting insulin. It could be due to the reason that patients might think insulin treatment means that their health status has deteriorated, and another possible explanation is that more complications are prevalent in type 1 diabetes patients. Of all the diabetes complications, retinopathy and antipathy were associated with the lowest treatment satisfaction. The satisfaction scores were lower in patients with complications, which is similar to the results reported in a study of Al-Aujan *et al.*<sup>[22]</sup> Koopmanschap *et al.*<sup>[23]</sup> reported in their study that diabetes complications had a significant impact on treatment satisfaction. A significant difference was observed in the satisfaction rates of diabetes patients visiting PHCs

and those visiting hospitals. Patients taking treatment from health centers ( $3.96 \pm 0.60$  vs.  $3.8 \pm 0.71$ ;  $P < 0.001$ ) had a significantly higher satisfaction score when compared with patients taking treatment from hospitals.

The data on medication taking behaviors of the diabetes patients revealed that adherence to taking medications as prescribed was good, and only 10.4% of the studied diabetic patients forgot to take their medicine. But, nearly one-fourth of the diabetic patients (22.3%) stopped taking their medication once they found that their health status had improved, and 18% of them stopped their medicines without the knowledge of their doctors. Difficulty in taking medications is related to lower satisfaction. The treatment satisfaction was significantly higher in patients with optimum biochemical values (mean values from 3.92 to 4.10). Diabetic patients with an HbA1C level of  $<6.5$  scored the highest satisfaction mean scores of 4.10 ( $P = 0.023$ ), which was significantly different from that of their counterparts. Multivariate analysis confirmed the study findings that the lower treatment satisfaction is significantly related to taking insulin, any diabetes complication, being an expatriate and age of the patient. Similar observations with multivariate analysis were reported in other studies.<sup>[5,20,21]</sup>

In the study sample of diabetic patients, a number of sociodemographic parameters were positively related to treatment satisfaction, which affected their quality of life and patient satisfaction. It is important to target those patients who are treated with insulin, have diabetes complications and have difficulties in adherence with medications. The study identified the sociodemographically vulnerable population among the diabetic patients in Qatar who needed more attention. This study supports the fact that patient satisfaction surveys can be an integral component of assessing care.

The limitations of the study need to be noted. The study sample includes Qataris and non-Qataris, which is a heterogeneous group, and their satisfaction responses can be different according to their culture, behavior and practice. Hence, responses might vary from nationality to nationality. Also, answers of the participants to the questionnaires might not be accurate, which will affect the accuracy of their answers.

## Conclusion

The study findings revealed that a positive association was found between diabetes patients' satisfaction with care and treatment. Patient satisfaction was positively associated with sociodemographic variables like high income, employment, married individuals and those with higher levels of education. We found lower treatment satisfaction in patients with diabetes-related complications.

Being unemployed and living alone had a particularly strong correlation with treatment satisfaction. The study identified the more disadvantaged diabetes patients who needed more attention in improving their health status.

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