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Illness Perception and Glycemic Control Among Type 2 Diabetes Patients

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ABSTRACT

Background: Type 2 Diabetes Mellitus (T2DM) is a serious issue in Egypt, with severe consequences for individuals, families, and governments. Illness perception in diabetes patients is critical in determining their health outcomes, particularly in glycemic management, and hence must be assessed and understood in order to optimize their health and quality of life. **Objective:** The current study aimed to improve the quality of life of T2DM patients through assessing their illness perception and identifying its associated factors.

Patients and methods: A cross-sectional was conducted on 157 T2DM Egyptian patients, between August 2021 and June 2022, at the outpatient clinic of Zagazig University Hospitals. Data on demographic and clinical history were collected using a structured Arabic questionnaire. Socioeconomic status and illness perception, using the brief illness perception questionnaire (BIPQ), were assessed.

Results: Most participants had negative illness perceptions (52.2%). There was a statistically significant difference between participants with good and poor glycemic control in perceptions of consequences (P<0.001), personal control (P= 0.013), and identity (P= 0.012), as well as overall score of illness perception (P=0.006). There was a statistically significant difference between participants with negative and positive illness perceptions in sex (P=0.001), socioeconomic status (P=0.012), type of medications (P<0.001), HbA1c (P=0.008), having a glucometer at home (P<0.001), and previous hospitalization due to diabetes-related complications (P<0.001).

Conclusion: T2DM patients suffer negative illness perceptions, especially those with poor glycemic control. Physicians need to take these perceptions into account, and interventions should be implemented to modify these perceptions with the purpose of positively affecting glycemic control.

Keywords: Type 2 Diabetes, Illness Perception, Glycemic Control.

INTRODUCTION

Diabetes Mellitus (DM) is a serious public health issue globally. According to the International Diabetes Federation (IDF), Egypt ranks ninth in terms of diabetes prevalence [1].

Diabetes causes a slew of long-term consequences, including cardiovascular disease and peripheral neuropathy, both of which can lead to disability. Diabetes frequently necessitates that patients modify their daily routine in order to better cope with treatment demands. Illness perception is important in determining the effects of this adjustment, and it has been shown to have a significant impact on adherence and self-management [2].

Sickness perception is the set of representations or ideas that individuals have about their illness, including views about the etiology of the illness, its potential effects, and whether or not it is treatable or self-manageable [3].

Understanding patients' disease beliefs and their relationship to glycemic management is critical for maintaining health and minimizing complications. Diabetes consequences are a significant financial burden for individuals, their families, and the Egyptian government [4].

Improved adherence and self-management can avert a large number of diabetes-related problems. Given the importance of disease perception in coping and self-management, we must assess sickness perception in the Egyptian diabetic community and its possible relationship with glycemic control. So yet, only few researches have looked into this link in the Egyptian setting. The current study aimed to improve the quality of life of type 2 Diabetes Mellitus (T2DM) patients through assessing their illness perception and identifying its associated factors.

PATIENTS AND METHODS

A cross-sectional was conducted on 157 T2DM Egyptian patients, between August 2021 and June 2022, at the outpatient clinic of Zagazig University Hospitals, Sharkia Governorate. A systematic sampling technique was used to choose T2DM patients from those who visit the diabetic outpatient clinic each week.

Inclusion criteria included T2DM patients, aged 18 or older, both sexes, and those excluded were those with critical illness, mental incompetence or gestational DM.

Tools for Data Collection: A structured Arabic questionnaire that included three sections:

I. Sociodemographic data, assessed according to **Fahmy *et al.*** [5]**.** Questions included parents' education, computer use, income, family size, crowding index, sewage, and refuse disposal.

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II. Clinical history taking, which included the following: duration of diabetes, family history, comorbidities, number and type of medication, access to a glucometer at home, diabetes-related complications or hospitalization, and history of smoking. Glycosylated hemoglobin (HbA1c), height, and weight were measured at the clinic.

III. Measurement of illness perception, according to the Brief Illness Perception Questionnaire (BIPQ) prepared by **Broadbent *et al.*** [6], and using the Arabic translation of the BIPQ validated by **Saarti *et al.*** [7]. It consists of nine questions, measuring the eight domains of illness perception (consequences, timeline, personal control, treatment control, identity, concern, understanding, and emotional response.) with eight questions that are answered on a scale of 0 to 10, in addition to an open-ended question about the perceived cause of illness.

Paper-and-pencil surveys were administered to diabetic patients reporting for follow-up at the outpatient clinic. Participants were given approximately 30 minutes to respond and any unclear questions or understanding issues were addressed.

1. Scoring system for evaluation of glycemic control: Glycemic control was categorized to "Good" and "Poor", based on the American Diabetes Association's recommendations [8], which state that, for glycemic control to be considered good, HbA1c levels need to be maintained below 7%.

2. Scoring sociodemographic data: Sociodemographic data was assessed using eight scales: education, occupation, computer use, income, family size, crowding index, sewage disposal and refuse disposal. Sociodemographic status was classified according to **Fahmy *et al.*** [5] into levels depending on the total score calculated from the sum of all eight scales, the maximum of which is 48, as follows: High [33.6-48 (≥70%)), Medium (19.2-<33.6 (40%-<70%)), Low (<19.2 (<40%)].

3. Scoring illness perception: The first eight questions are rated using a 0-10 response scale as follows: Consequences: (0 = no effect at all, 10 = severely affects my life), Timeline: (0 = a very short time, 10 = forever), etc. Higher scores on personal control, treatment control, and understanding indicate positive perceptions, while higher scores on all the other domains indicate negative perceptions.

Assessment of the causal representation is by open-ended responses which were then grouped into categories and analyzed accordingly.

Overall illness perception is calculated by reversing the scores of personal control, treatment control, and understanding, and calculating the sum of the 1st eight questions, with higher scores indicating negative perception and lower scores indicating positive perception. For each domain, the median score is 5. If the participant's score equals or is less than 5, they are considered to have a positive perception. If it is higher than 5, they are considered to have a negative perception. For overall illness perception levels, the maximum possible score for overall illness perception equals 80. The median of which is 40. If the participant's score equals or is less than 40, they are considered to have a positive overall perception. If it is higher than 40, they are considered to have a negative overall perception.

Ethical Consideration:

This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Zagazig University Mansoura. The patients were informed about the nature and steps of the study and a verbal consent was taken from participants in the study. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

Statistical Analysis

The collected data was analyzed using R programming language version 4.0.4 [9]. The following R packages were used: tidyverse, gtsummary, flextable, and officer [10-11].

Data was summarized using mean, standard deviation, and range for continuous variables, and counts and percentages for categorical variables. HbA1c and illness perception were summarized as continuous variables, then categorized and summarized according to the scoring system described below. Independent sample t-test, Chi-square and Fisher's exact tests were used in univariate analyses for comparisons between good and poor glycemic control as well as positive and negative illness perception. Binary logistic regression was used to determine factors associated with good and poor glycemic control and positive and negative illness perception. P value ≤0.05 was considered to be statistically significant.

RESULTS

Table 1 summarizes the sociodemographic and clinical characteristics of the studied T2DM patients.

Table (1): Sociodemographic and clinical characteristics of the surveyed T2DM patients at Zagazig University Hospital.

Characteristic	N (%)
Sociodemographic characteristics	
Age	
Mean ± SD	**52.17 ± 12.96**
Range	**15 – 75**
Sex	
Female	**113 (72.0)**
Male	**44 (28.0)**
Socioeconomic status	
Low	**17 (10.8)**
Medium	**98 (62.4)**
High	**42 (26.8)**
Duration of DM	
Less than 5 years	**67 (42.7)**
5 to 10 years	**42 (26.8)**
More than 10 years	**48 (30.6)**
Family history	
Yes	**113 (72.0)**
No	**44 (28.0)**
Smoking status	
Yes	**13 (8.3)**
No	**144 (91.7)**
Body Mass Index (BMI)	
Mean ± SD	**33.42 ± 6.87**
Range	**17.31 - 57.81**
Clinical characteristics	
Comorbidities	**109 (69.4)**
Hypertension	**75 (47.8)**
Coronary Artery Disease	**21 (13.4)**
Hyperlipidemia	**13 (8.3)**
Hypothyroidism	**9 (5.7)**
Number of medications	
1	**77 (49.0)**
2	**59 (37.6)**
≥3	**21 (13.4)**
Type of medications	
Oral	**124 (79.0)**
Insulin	**12 (7.6)**
Insulin + Oral	**21 (13.4)**
HbA1c	
Mean ± SD	**7.53 ± 1.68**
Range	**4.80 - 13.60**
Glycemic control	
Good	**63 (40.1)**
Poor	**94 (59.9)**
Glucometer at home	**104 (66.2)**
Previous hospitalization	**30 (19.1)**

Most participants had a negative perception of their illness' consequences affecting their lives (58%) **(Table 2)**.

Table (2): Distribution of the surveyed T2DM cases, according to illness perception.

Domain	Negative perception N (%)	Positive perception N (%)
Consequences: Perception of illness affecting life	**91 (58.0)**	**66 (42.0)**
Timeline: Perception of illness continuity	**136 (86.6)**	**21 (13.4)**
Personal control: Feeling about illness control*	**40 (25.5)**	**117 (74.5)**
Treatment control: Perception of treatment effect on control*	**22 (14.0)**	**135 (86.0)**
Identity: Perception of illness symptoms	**88 (56.1)**	**69 (43.9)**
Concern: Feeling concerned about illness	**79 (50.3)**	**78 (49.7)**
Understanding: Perception of understanding of illness*	**31 (19.7)**	**126 (80.3)**
Emotional response: Perception of emotional effect of illness	**93 (59.2)**	**64 (40.8)**
Overall illness perception**	**82 (52.2)**	**75 (47.8)**
Perceived causes	**N (%)**	
Psychological***	**89 (57)**	
Lifestyle******	**42 (27)**	
Family history	**40 (25)**	
Physical conditions*******	**25 (16)**	
Do not know	**22 (14)**	

*Items for personal control, treatment control, and understanding are reverse-scored and added to the sum score. **Higher scores indicate more negative IP, while lower scores indicate more positive IP. ***Psychological causes included: anxiety, depression, stress, trauma, and psychological exhaustion. ****Lifestyle factors included: diet (specifically, overconsumption of carbohydrates, soda, sweets, and fatty diet), physical inactivity, sedentary life, and unhealthy habits. *****Physical conditions included: obesity, hypertension, hypothyroidism, pregnancy, kidney disease, and COVID-19.

In univariate analysis, there was a statistically significant difference between participants with good glycemic control and those with poor glycemic control in duration of DM (P= 0.001), prevalence of coronary artery disease (P=0.009), and number (P=0.034) and type (P=0.017) of anti-diabetic medications **(Table 3)**. Regarding domains of illness perception, there was a statistically significant difference between participants with good glycemic control and those with poor glycemic control in consequences (P<0.001), personal control (P=0.013), and identity (P=0.012) as well as overall score of illness perception (P=0.006).

Table (3): Comparison of sociodemographic and clinical features between T2DM patients with good and poor glycemic control

Characteristic	Good glycemic control, N = 63[1]	Poor glycemic control, N = 94[1]	P-value[2]
Demographic factors			
Age	50 ± 13	54 ± 13	0.070
Sex			0.4
Female	43 (38.1%)	70 (61.9%)	
Male	20 (45.5%)	24 (54.5%)	
Socioeconomic status			0.3
Low	5 (29.4%)	12 (70.6%)	
Medium	37 (37.8%)	61 (62.2%)	
High	21 (50.0%)	21 (50.0%)	
Duration of DM			0.001
Less than 5 years	33 (49.3%)	34 (50.7%)	
5 to 10 years	21 (50.0%)	21 (50.0%)	
More than 10 years	9 (18.8%)	39 (81.2%)	
Family history			0.2
Yes	42 (37.2%)	71 (62.8%)	
No	21 (47.7%)	23 (52.3%)	
Smoking status			0.6
Yes	6 (46.2%)	7 (53.8%)	
No	57 (39.6%)	87 (60.4%)	
Body Mass Index (BMI)	33 ± 7	33 ± 6	0.908
Clinical characteristics			
Comorbidities	45 (41.3%)	64 (58.7%)	0.7
Hypertension	31 (41.3%)	44 (58.7%)	0.8
Coronary Artery Disease	3 (14.3%)	18 (85.7%)	0.009
Hyperlipidemia	7 (53.8%)	6 (46.2%)	0.3
Hypothyroidism	6 (66.7%)	3 (33.3%)	0.2
Number of medications			0. 019
1	37 (48.1%)	40 (51.9%)	
2	23 (39.0%)	36 (61.0%)	
≥3	3 (14.3%)	18 (85.7%)	
Type of medications			0.017
Oral	56 (45.2%)	68 (54.8%)	
Insulin	1 (8.3%)	11 (91.7%)	
Insulin + Oral	6 (28.6%)	15 (71.4%)	
Glucometer at home	43 (41.3%)	61 (58.7%)	0.7
Previous hospitalization	8 (26.7%)	22 (73.3%)	0.094
Illness perception domains			
Consequences	4 ± 4	6 ± 3	<0.001
Timeline	8 ± 3	9 ± 3	0.12
Personal control	7 ± 3	6 ± 3	0.013
Treatment control	8 ± 3	7 ± 3	0.092
Identity	4 ± 4	6 ± 3	0.012
Concern	5 ± 4	6 ± 4	0.2
Understanding	8 ± 3	7 ± 4	0.092
Emotional response	6 ± 4	6 ± 4	0.9
Overall illness perception	35 ± 18	42 ± 16	0.006
Perceived causes			
sychological	41 (46.1%)	48 (53.9%)	0.082
Lifestyle	18 (42.9%)	24 (57.1%)	0.7
Family history	14 (35.0%)	26 (65.0%)	0.4
Physical conditions	8 (32.0%)	17 (68.0%)	0.4
Do not know	5 (22.7%)	17 (77.3%)	0.073

Characteristic	Good glycemic control, N = 63[1]	Poor glycemic control, N = 94[1]	P-value[2]
[1]Mean ± SD; n (%),[2]Welch Two Sample t-test; Pearson's Chi-squared test; Fisher's exact test			

Table 4 shows that there was a statistically significant difference between participants with negative and positive illness perceptions in sex (P= 0.001), socioeconomic status (P=0.012), type of medications (P<0.001), HbA1c (P=0.008), having a glucometer at home (P<0.001), and previous hospitalization due to diabetes-related complications (P<0.001).

Table (4): Comparison of sociodemographic and clinical features between T2DM patients with negative and positive illness perception.

Characteristic	Negative perception, N = 82	Positive perception, N = 75	P-value[1]
Demographic factors			
Age	**51 ± 13**	**53 ± 13**	**0.5**
Sex			**0.001**
Female	**68 (60.2%)**	**45 (39.8%)**	
Male	**14 (31.8%)**	**30 (68.2%)**	
Socioeconomic status			**0.012**
Low	**13 (76.5%)**	**4 (23.5%)**	
Medium	**54 (55.1%)**	**44 (44.9%)**	
High	**15 (35.7%)**	**27 (64.3%)**	
Duration of DM			**0.078**
Less than 5 years	**28 (41.8%)**	**39 (58.2%)**	
5 to 10 years	**25 (59.5%)**	**17 (40.5%)**	
More than 10 years	**29 (60.4%)**	**19 (39.6%)**	
Family history			**0.7**
Yes	**58 (51.3%)**	**55 (48.7%)**	
No	**24 (54.5%)**	**20 (45.5%)**	
Smoking status			**0.3**
Yes	**5 (38.5%)**	**8 (61.5%)**	
No	**77 (53.5%)**	**67 (46.5%)**	
Body Mass Index (BMI)	**34 ± 7**	**33 ± 7**	**0.2**
Clinical Characteristics			
Comorbidities	**56 (51.4%)**	**53 (48.6%)**	**0.7**
Hypertension	**41 (54.7%)**	**34 (45.3%)**	**0.6**
Coronary Artery Disease	**12 (57.1%)**	**9 (42.9%)**	**0.6**
Hyperlipidemia	**4 (30.8%)**	**9 (69.2%)**	**0.11**
Hypothyroidism	**3 (33.3%)**	**6 (66.7%)**	**0.3**
Number of medications			**0. 061**
1	**37 (48.1%)**	**40 (51.9%)**	
2	**29 (49.2%)**	**30 (50.8%)**	
≥3	**16 (76.2%)**	**5 (23.8%)**	
Type of medications			**<0.001**
Oral	**54 (43.5%)**	**70 (56.5%)**	
Insulin	**11 (91.7%)**	**1 (8.3%)**	
Insulin + Oral	**17 (81.0%)**	**4 (19.0%)**	
HbA1c	**7.85 ± 1.73**	**7.19 ± 1.56**	**0.008**
Glucometer at home	**43 (41.3%)**	**61 (58.7%)**	**<0.001**
Previous hospitalization	**24 (80.0%)**	**6 (20.0%)**	**<0.001**
[1]Welch Two Sample t-test; Pearson's Chi-squared test; Fisher's exact test; Wilcoxon rank sum test.			

Table 5 represents multiple regression analyses of the effect of duration of DM, presence of coronary artery disease, number and type of anti-diabetic medications prescribed, as well as the illness perception domains of consequences, personal control, and identity on HbA1c as a response variable. Only number of medications (P=0.012) and the domain of perception of illness consequences (P=0.005) were found to be significant predictors of HbA1c levels.

The model was statistically significant (P<0.001) and explained 19.9% (R2) of the variability in HbA1c.In analyzing the effect of sex, socioeconomic status, type of medication, HbA1c, having a glucometer available at home, and previous hospitalization due to diabetes-related reasons on overall illness perception scores as a response, only type of medication; insulin (P=0.045) and Insulin-oral combination (P=0.007), HbA1c (P=0.011), and having a glucometer at home (P=0.022) were significant predictors of overall illness perception.

The model was statistically significant (P<0.001) and explained 29.5% (R^2) of the variability in overall illness perception scores.

Table (5): Multiple linear regression of factors associated with HbA1c levels and illness perception

Variable	Beta	95% CI[1]	Standard Error	P-value
Model 1: Predictors of HbA1c				
Duration of DM				
Less than 5 years	**0.00**	**—**	**—**	
5 to 10 years	**-0.18**	**-0.81, 0.44**	**0.32**	**0.6**
More than 10 years	**0.27**	**-0.40, 0.94**	**0.34**	**0.4**
Coronary Artery Disease				
No	**0.00**	**—**	**—**	
Yes	**0.22**	**-0.52, 1.0**	**0.38**	**0.6**
Number of medications	**0.53**	**0.12, 0.93**	**0.21**	**0.012**
Type of medication				
Oral	**0.00**	**—**	**—**	
Insulin	**0.86**	**-0.20, 1.9**	**0.54**	**0.11**
Insulin + Oral	**-0.40**	**-1.3, 0.48**	**0.44**	**0.4**
Consequences	**0.15**	**0.04, 0.25**	**0.05**	**0.005**
Personal control	**-0.03**	**-0.12, 0.06**	**0.05**	**0.5**
Identity	**-0.03**	**-0.13, 0.07**	**0.05**	**0.6**
[1]CI = Confidence Interval				
R^2 = 0.199; p-value = <0.001				
Model 2: Predictors of overall illness perception				
Sex				
Female	**0.00**	**—**	**—**	
Male	**-5.3**	**-11, 0.22**	**2.82**	**0.060**
Socioeconomic status				
Low	**0.00**	**—**	**—**	
Medium	**-4.3**	**-12, 3.9**	**4.12**	**0.3**
High	**-7.7**	**-17, 1.4**	**4.61**	**0.10**
Type of medication				
Oral	**0.00**	**—**	**—**	
Insulin	**9.5**	**0.21, 19**	**4.71**	**0.045**
Insulin + Oral	**9.9**	**2.8, 17**	**3.58**	**0.007**
HbA1c	**1.9**	**0.45, 3.3**	**0.73**	**0.011**
Glucometer at home				
No	**0.00**	**—**	**—**	
Yes	**-6.1**	**-11, -0.89**	**2.64**	**0.022**
Previous hospitalization				
No	**0.00**	**—**	**—**	
Yes	**6.3**	**-0.11, 13**	**3.26**	**0.054**

Table (5): Multiple linear regression of factors associated with HbA1c levels and illness perception

Variable	Beta	95% CI[1]	Standard Error	P-value
[1]CI = Confidence Interval				
R^2 = 0.295; p-value = <0.001				

DISCUSSION

This study was carried out to examine diabetes patients' disease perceptions and to investigate probable variables influencing them. The percentage of patients with poor glycemic control in our research was significantly lower than that reported in China, Jordan, and Saudi Arabia [12-14], but was comparable to that reported in Libya [15]. Poor glycemic control was substantially related with a longer duration of diabetes, as previously reported [12].

The number of prescription diabetic drugs was previously connected with glycemic control in the literature [16], while monotherapy was associated with lower HbA1c. The kind of medicine administered was also important, since individuals who take oral anti-diabetic drugs had better glycemic control [15]. This is most likely because patients with poor glycemic control are shifted to more rigorous insulin or combination therapy when oral medicine alone fails to reach glycemic objectives.

Poor glycemic control was substantially correlated with participants' more unfavorable perceptions of the implications of their illness and symptoms associated with it, as well as their more positive view of their level of personal control over it. Previous study has found a link between sickness perception and glycemic control [17]. Only medication quantity and perception of consequences were significant predictors of glycemic control in multiple linear regression models.

The majority of participants showed a negative attitude towards disease, however the mean overall score was somewhat higher than that reported by **Nie *et al.*** [18]. They, on the other hand, had a better awareness of diabetes and a better understanding of how their condition affected their life. They exhibited a fairly good impression of personal control over their sickness, as well as a favorable opinion of the function of their therapy in treating their condition. They had moderate symptoms; therefore they had a moderately negative impression of sick identity, were somewhat concerned about their illness, and were considerably emotionally affected by it. These disparities in perception across patients in the current study and other studies such as **Nie *et al.*** [18] might be attributed to cultural variations as well as varying degrees of health literacy and diabetes-related information.

The majority of individuals blamed DM on psychological causes, followed by lifestyle factors, family history, and physical circumstances. These are comparable to **Tang and Gao** [14] stated perceived reasons. However, nutrition was identified as the first reason in their study, which they explained by using the Chinese cultural view that diet is significantly related with health.

As previously reported [14], gender and socioeconomic status were related to illness perception scores; with females more likely to have a negative perception of their illness and those with higher status having lower scores (more positive illness perception). However, neither of these variables was a significant predictor of overall illness perception in the regression model.

On the other hand, medication type and HbA1c were significant predictors of illness perception and were found to be associated with it in a recent study conducted in Egypt [17]. Patients with higher HbA1c exhibited more negative attitudes, and those getting both oral and insulin treatment had more negative attitudes than those receiving only oral therapy. Patients with higher HbA1c also showed more negative attitudes than those receiving only oral therapy. While recent hospitalization for diabetes-related complications was significantly linked with a poor illness perception, which was expected but did not predict perception scores in the model, having a glucometer at home predicted a more positive attitude.

Limitations: Because this was a cross-sectional study, it was insufficient to demonstrate causality. The study's important findings simply show probable relationships. Because this study depended on self-reporting, recollection bias might have influenced the results.

CONCLUSIONS

T2DM patients receiving follow-up care at Zagazig University Hospital had poor glucose control and unfavorable attitudes towards their condition. Glycemic control was related to the length of DM, the presence of coronary artery disease, the quantity and kind of prescription drugs, the perception of side effects, individual control, and the identification of the condition. Sex, socioeconomic level, the kind of medicine taken, HbA1c, having a glucometer at home, and past hospitalization for diabetes-related issues were all factors linked to disease perception.

RECOMMENDATIONS

In order to significantly improve glycemic control, interventional research must study the likelihood and impact of altering patients' perceptions of their condition. Longitudinal studies are required to establish causality. Healthcare practitioners must consider how the patient's perspective may affect their prognosis. The clinical examination should include a discussion of these perspectives.

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