



# Facteurs de risque d'altération de la qualité de vie des patients diabétiques en Tunisie

## Risk factors for impaired quality of life in diabetic patients in Tunisia

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### ABSTRACT

**Background:** Quality of life preservation is crucial in the management of chronic diseases, in particular diabetes.

**Aim:** To identify risk factors for the impaired quality of life of Tunisian diabetic patients.

**Methods:** A cross-sectional study that collected type 1 and type 2 diabetic patients, selected by convenience sampling was conducted. Diabetic patients received a self-administered questionnaire in Arabic containing general and clinical data and a validated Arabic version of the "Diabetes Health Profile -18".

**Results:** Three hundred and thirty-three type 1 and type 2 diabetic patients, whose age was  $\geq 40$  years in 78.1% of cases with a sex ratio of 0.94, were collected. The answers to the questionnaire highlighted a globally impaired quality of life for the diabetic patients with an average of 30.21 (7.06). Binary regression analysis presented globally significant models reflecting impairment risk factors for diabetic patients' quality of life. Female gender (AOR= 1.7;  $p= 0.036$ ), comorbidities associated with diabetes (AOR = 1.23;  $p<10^{-3}$ ), diabetes complications (AOR= 1.45;  $p=0.041$ ) and irregular medical follow-up (AOR=4.19;  $p<10^{-3}$ ) were risk factors for impaired diabetic patients' quality of life.

**Conclusion:** This study underlines the major role of a holistic diabetic patient care for better identification and management of risk factors of impaired quality of life.

**Keywords:** Quality of life impairment; Diabetes; Risk factors; Associated factors; Diabetes Health Profile-18.

### RÉSUMÉ

**Introduction :** Le maintien de la qualité de vie est un élément essentiel dans la prise en charge des maladies chroniques, notamment le diabète.

**Objectif :** Identifier les facteurs de risque de l'altération de la qualité de vie des diabétiques tunisiens.

**Méthodes :** Une étude transversale a été menée rassemblant des diabétiques de type 1 et de type 2, sélectionnés par un échantillonnage non probabiliste de convenance. Les diabétiques ont reçu un questionnaire auto-administré rédigé en arabe contenant des données générales et cliniques et une version arabe validée du « Diabetes Health Profile – 18 ».

**Résultats :** Trois cent trente-trois diabétiques de type 1 et de type 2, dont l'âge était  $\geq 40$  ans dans 78,1% des cas avec un sexe ratio de 0,94, ont été colligés. Les réponses au questionnaire ont mis en évidence une qualité de vie des diabétiques de l'étude globalement altérée avec une moyenne de 30,21 (7,06). L'analyse de la régression logistique binaire a montré que le sexe féminin (OR ajusté=1,7 ;  $p=0,036$ ), la présence de comorbidités associés au diabète (OR ajusté= 1,23 ;  $p<10^{-3}$ ), les complications du diabète (OR ajusté= 1,45 ;  $p=0,041$ ) et l'irrégularité du suivi médical (OR ajusté=4,19 ;  $p<10^{-3}$ ) étaient des facteurs de risque de l'altération de la qualité de vie des diabétiques.

**Conclusion :** Cette étude souligne le rôle majeur d'une prise en charge globale et de la gestion des facteurs de risque de l'altération de la qualité de vie des diabétiques.

**Mots clés :** Altération de la qualité de vie ; Diabète ; Facteurs de risque ; Facteurs associés ; Diabetes Health Profile-18.

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## INTRODUCTION

Diabetes mellitus is a chronic disease that has a wide range of effects on patients' lives [1]. The World Health Organization (WHO) and the International Diabetes Federation's most recent estimations showed a definite rise in its prevalence globally [2, 3]. It is estimated that the Middle East and North Africa will experience a 96% increase in the number of people with diabetes between 2019 and 2045 [3]. Similar to other nations in the epidemiological transition phase, diabetes mellitus is on the rise in Tunisia, where the prevalence could reach 11.7% in 2030[4]. This increase is mainly attributed to changes in lifestyle and dietary habits [4].

Diabetes has a significant impact on the quality of life of patients in Tunisia. According to a research by Haoues et al. (2021) [5], Tunisian diabetic patients had higher scores on all subscales of the "Diabetes Health Profile-18" (DHP-18), including "psychological distress" and "barriers to activities," as well as "disinhibited eating." An impaired quality of life was indicated by the high overall quality of life score [5]. The same authors' more recent (2023) and larger analysis revealed similar findings in 57.5% of the cases [6]. An age < 40 years and a low level of knowledge about diabetes were predictors of impaired quality of life in Tunisian patients with type 1 diabetes mellitus (T1DM). In type 2 diabetes mellitus (T2DM), a female sex, insulin therapy, and a low level of knowledge about diabetes were the impairment predictors [6].

Diabetes disrupts patient's daily life, modifies his relations with his family, friends and professional circles and can give rise to fear of death. The diabetic patient fears seeing his identity reduced to his illness in the eyes of others. There are twice as many depressions in diabetic patients as in the general population [7]. Psychological disorders, ranging from temporary low morale to proven depression, can lead them to abandon their work, source of their income and their personal valorization [8–10].

Lifestyle changes imposed by diabetes require adjustments from diabetic patients and those around them. These constraints can induce a feeling of guilt, anger, loss of self-esteem, and even difficulties in social integration [8].

In this study, we propose to measure quality of life in diabetic patients in Tunisia and identify its impairment 'risk factors.

## METHODS

A cross-sectional study was conducted to meet the aim of the study. Data collection lasted four months and two weeks and took place in the departments that take care of diabetic patients in Sahloul and Farhat Hached university hospitals and in eight basic health centers in Sousse region (Tunisia).

### Study population

Patients with T1DM and T2DM, aged 18 and over, whose diabetes

had been evolving for at least a year and who were able to read and understand a newspaper in Arabic, were included in the study after a convenience sampling. Diabetic patients over the age of 65 who had cognitive problems or a mental condition impairment as determined by the validated Tunisian version of the "Mini-Mental State Examination (MMSE)" were excluded from the study [11].

The minimum sample size of diabetic patients (n) was calculated according to the Cochran formula ( $n = z\alpha/2^2 p(1-p)/i^2$ ). For a proportion (p) of 84% of Tunisian diabetic patients with an impaired quality of life [12], a level of confidence (z) equal to 1.96 and a margin of error (i) of 5%, the minimum size of the sample was estimated at 207. The number was extended to 249 diabetic patients, considering a non-response rate of 20%.

### Data collection

Patients with diabetes were conducted to answer an Arabic-language self-administered questionnaire. About 20 minutes were required to fill it. The questionnaire included a first section intended for the collection of general and clinical data from the participants. The DHP-18 was translated and validated for use in Arabic in a second section of the questionnaire [5]. Additional data was taken from the medical records of diabetic patients to ensure the accuracy of the answers.

General data were age, gender, marital status, level of education, income status, habitat, Body Mass Index (BMI), tobacco use, physical activity practicing and comorbidities associated with diabetes.

Age was divided into two categories, less than 40 years and greater than or equal to 40 years [13].

The BMI distinguished a state of thinness when it was less than 18.5 kg/m<sup>2</sup>, a normal weight between 18.5 and 24.9 kg/m<sup>2</sup>, overweight if the BMI was between 25 and 30 kg/m<sup>2</sup> and obesity above 30 kg/m<sup>2</sup> [14].

The income status was based on the social position of the participant according to his income, his education and his occupation [15]. It was assessed subjectively (Low, Middle, Decent) by the participant himself.

Clinical data on diabetes were diabetes type, its duration, diabetes family history, diabetes therapeutic modalities, therapeutic compliance, diabetes complications, glycemic balance assessed by the most recent value of glycated hemoglobin (HbA1c), previous therapeutic education sessions, glycemic self-monitoring, foot care and regular medical follow-up.

The duration of diabetes was divided into two categories, less than 10 years or greater than or equal to 10 years [13].

According to WHO recommendations, a patient is considered "compliant" if he respects at least 80% of his therapist's instructions [16]. Thus, the result of this parameter was based on the judgment of the attending therapist.

An HbA1c value of less than 7% and without hypoglycemia was considered to indicate good glycemic control. When HbA1c was between 7% and 8% (without hypoglycemia), glycemic control

was acceptable and poor when HbA1c was above 8% [17].

Three dimensions of the DHP-18, including psychological distress (six items), activity barriers (seven items), and disinhibited eating (five items), were used to assess the psychological and behavioral functioning of the diabetic patient [18].

The questionnaire's overall score is calculated by adding the individual scores. The range is 0 to 54. In order to demonstrate good psychological and behavioral functioning, a score must be less than or equal to the theoretical median [0-27] [18]. Rescale the scores of the three dimensions on a scale of zero to 100 (the raw score of each dimension divided by the overall score, multiplied by 100) is an additional technique of rating the DHP-18. Scores that are higher above the predicted median [50-100] using this method suggest psychological and behavioral dysfunction [18]. In our study, we applied both scoring techniques.

**Statistical analysis**

The statistical study was conducted using Statistical Package for the Social Sciences software version 21.0. Categorical variables were expressed as number (n) and relative frequency (%). The quantitative ones were summarized by measurements of central trend (mean) and dispersion (standard deviation).The crossing of two categorical variables, was carried out using the Pearson chi-square test. The significance level was set at 5% for all tests.

To perform the multivariate analysis, variables significant at  $p \leq 0.2$  were retained. A binary logistic regression was carried out according to the "Backward: Wald" method, based on the lower reference modality, in order to obtain a model identifying impaired quality of life' risk factors in diabetic patients. Some variables were forced into the initial model after studying their theoretical importance in the literature. Odds ratios (OR), adjusted OR (AOR), 95% confidence intervals (95% CI), and p-value were determined.

**Ethical considerations**

Under the reference CEFMS 54/ 2020, the project received approval from the Sousse Faculty of Medicine Human Research Ethics Committee. A permission form that was written in Arabic and approved by the same Ethics Committee, was sent to participants to read and sign. They were told both orally and in writing that they might leave the study at any moment.

**RESULTS**

**General and specific data on diabetes (Table 1)**

A total of 333 diabetic patients were gathered, with an average age of 40 years old in 85.9% of the cases. There was a 0.94 sex ratio. In 65.5% of the cases, they were married. In 40.8% of cases, participants had a primary

education level. A level of secondary or higher education was found in 41.1% and 18.1%, respectively. In 61% of the instances, the socioeconomic status was average, and 70.3% of them resided in cities. Patients with diabetes were not working in 62% of cases and were students in 5%. More than half of them (51.9%) were overweight or obese, and 61% were smokers. Physical inactivity was reported by 86.2% of participants.

**Table 1.** Diabetic patients' general and specific data (n=333)

		n	%	
General data	<40	73	21.9	
	≥ 40	260	78.1	
Gender	Male	161	48.3	
	Female	172	51.7	
Marital Status	Single	55	16.5	
	Married	218	65.5	
	Divorced	19	5.7	
	Widow (er)	41	12.3	
Level of education	Primary	136	40.9	
	Secondary	137	41.1	
	University	60	18.0	
Income status	Low	101	30.3	
	Middle	203	61.0	
	Decent	29	9.7	
Habitat	Rural	99	29.7	
	Urban	234	70.3	
BMI (kg/m <sup>2</sup> )	Thin	10	3.0	
	Normal	150	45.1	
	Overweight	160	48.1	
	Obese		3.8	
Tobacco use	No	130	39.0	
	Yes	203	61.0	
Practice of physical activity	No	287	86.2	
	Yes	46	13.8	
Comorbidities associated with diabetes	No	123	36.9	
	Yes	210	63.1	
<b>Clinical data on diabetes</b>				
Diabetes type	T1D	90	27.0	
	T2D	243	73.0	
Diabetes family history	No	107	32.1	
	Yes	226	67.9	
Duration of diabetes (Years)	< 10	199	60.3	
	≥ 10	134	39.7	
Treatment modalities	Lifestyle and dietary measures only	12	3.6	
	Antidiabetic drugs	168	50.4	
	Insulin (alone or combined with antidiabetic drugs)	202	60.7	
Therapeutic compliance	No	63	18.9	
	Yes	270	81.1	
Diabetes complications	No	204	61.3	
	Yes	Heart	24	7.2
		Eye	22	6.6
		Kidney	9	2.7
		Foot	20	6.0
		> 3 affected organs	54	16.2
		Total	129	38.7
Glycemic Balance	≤ 7%	67	20.1	
	7 à 8%	127	38.1	
	≥ 8%	139	41.8	
Therapeutic education	No	153	45.9	
	Yes	180	54.1	
Glycemic self-monitoring	No	223	67.0	
	Yes	110	33.0	
Foot care	No	311	93.7	
	Yes	21	6.3	
Regular medical follow-up	No	167	50.2	
	Yes	166	49.8	

BMI: Body Mass Index, n=number, %= relative frequency

### Description of the quality of life of diabetic patients

In 65.5% of cases, diabetic patients had poorer quality of life, as measured by the DHP-18 (overall DHP-18 score equal to or greater

than the theoretical median [0-27]). The three dimensions of the questionnaire were impacted by this limitation. (Table 2).

**Table 2.** Description of quality of life of diabetic patients (n=333)

Items	Always		Usually		Sometimes		Never	
	n	%	n	%	n	%	n	%
<b>DHP1</b>	135	40.6	143	42.9	50	15.0	5	1.5
<b>DHP2</b>	63	18.9	145	43.6	115	34.5	10	3.0
<b>DHP3</b>	58	17.4	189	56.8	72	21.6	14	4.2
<b>DHP4</b>	200	60.1	74	22.2	54	16.2	5	1.5
<b>DHP5</b>	40	12.0	124	37.2	148	44.5	21	6.3
<b>DHP6</b>	32	9.6	112	33.6	170	51.1	19	5.7
<b>DHP7</b>	47	14.1	121	36.3	144	43.3	21	6.3
	<b>Very much more</b>		<b>A lot more</b>		<b>A few more</b>		<b>Not at all</b>	
	n	%	n	%	n	%	n	%
<b>DHP8</b>	39	11.7	141	42.3	148	4.5	5	1.5
	<b>Very easy</b>		<b>Quiet easy</b>		<b>Not very easy</b>		<b>Not at all easy</b>	
	n	%	n	%	n	%	n	%
<b>DHP9</b>	18	5.4	74	22.2	213	64.0	28	8.4
	<b>Very likely</b>		<b>Quiet likely</b>		<b>Not very likely</b>		<b>Not at all likely</b>	
	n	%	n	%	n	%	n	%
<b>DHP10</b>	24	7.2	232	69.7	65	19.5	12	3.6
	<b>Very much</b>		<b>A lot</b>		<b>A little</b>		<b>Not at all</b>	
	n	%	n	%	n	%	n	%
<b>DHP11</b>	69	20.7	181	54.4	71	21.3	12	3.6
<b>DHP12</b>	61	18.3	52	15.6	196	58.9	24	7.2
<b>DHP13</b>	22	6.6	48	14.4	229	68.8	34	10.2
<b>DHP14</b>	34	10.2	53	15.9	196	58.9	50	15.0
	<b>Very often</b>		<b>Often</b>		<b>Sometimes</b>		<b>Never</b>	
	n	%	n	%	n	%	n	%
<b>DHP15</b>	77	23.1	153	46.0	90	27.0	13	3.9
<b>DHP16</b>	49	14.7	125	37.5	150	45.1	9	2.7
<b>DHP17</b>	44	13.2	169	50.8	113	33.9	7	2.1
<b>DHP18</b>	42	12.6	118	35.4	165	49.6	8	2.4
Score of the "Psychological Distress" dimension			M(SD)		55.41 (18.80) [5.56 ; 100]			
Score of the "Barriers to activity" dimension			M (SD)		60.00 (14.77) [4.76 ; 95.24]			
Score of the "Disinhibited eating" dimension			M (SD)		50.89 (13.33) [13.33 ; 100]			
Overall DHP-18 score			M(SD)		30.21 (7.06) [5.00 ; 51.00]			

DHP-18: Diabetes Health Profile-18, M: mean; n=number, SD: standard deviation; %= relative frequency

### Factors associated with impaired quality of life in diabetic patients

Bivariate analysis showed that, impaired quality of life was more marked in diabetic patients with comorbidities associated with diabetes (OR=1.44; p=0.005). Insulin injections (OR= 1.62; p=0.039), therapeutic noncompliance (OR=1.62; p=0.004), diabetes complications (OR=1.65; p=0.043), glycemic imbalance (p=0.005) and irregular medical follow-up (OR=2.47; p<10<sup>-3</sup>) were also associated with impaired quality of life (Table 3).

### Risk factors for impaired quality of life in diabetic patients

Binary regression analysis presented a significant model reflecting impairment risk factors for diabetic patients' quality of life. Female gender (AOR= 1.7; p= 0.036), comorbidities associated with diabetes (AOR = 1.23; p<10<sup>-3</sup>), diabetes complications (AOR= 1.45; p=0.041) and irregular medical follow-up (AOR=4.19; p<10<sup>-3</sup>) increased the DHP-18 score and were risk factors for impaired diabetic patients' quality of life (Table 3). On the contrary, glycemic self-monitoring was a protective factor against impaired quality of life in diabetic patients (AOR= 0.44; p=0.007) (Table 3).

**Table 3.** Binary logistic regression identifying factors influencing the quality of life of diabetic patients (n=333)

Variables		Quality of life		OR [CI at 95%]	p	AOR [CI at 95%]	p
General data		Impaired n(%)	Satisfactory n(%)				
<b>Gender</b>	Female	117(68.0)	55(32.0)	1	0.310	1	0.036
	Male	101(92.7)	60(37.3)	1.26[0.80-1.99]			
<b>Age (Years)</b>	<40	53(72.6)	20(27.4)	1	0.147	-	-
	≥ 40	165(63.5)	95(36.5)	1.53[0.86-2.71]			
<b>Martial status</b>	Single	38(69.1)	17(30.9)	1	0.883	-	-
	Married	140(64.2)	78(35.8)	1.18[0.73-1.90]			
	Divorced	12(63.2)	7(36.8)	1.13[0.43-2.91]			
	Widow (er)	28(68.3)	13(31.7)	0.87[0.43-1.74]			
<b>Level of education</b>	Primary	97(71.3)	39(28.7)	1	0.137	-	-
	Secondary	82(59.9)	55(40.1)	1.52[0.96-2.40]			
	University	39(65.0)	21(35.0)	1.03 [0.57-1.84]			
<b>Income status</b>	Low	68(67.3)	33(32.7)	1	0.576	-	-
	Middle	129(63.5)	74(36.5)	1.25[0.78-1.99]			
	Decent	21(72.4)	8(27.6)	0.70[0.30-1.64]			
<b>Habitat</b>	Rural	70(70.7)	29(29.3)	1	0.191	-	-
	Urban	148(63.2)	86(36.8)	0.71[0.43-1.19]			
<b>BMI (kg/.m2)</b>	Thin	5(50,0)	5(50,0)	1	0,789	-	-
	Normal	86(57,3)	64(42,7)	0,74[0,25-2,16]			
	Overweight	94(58,6)	66(41,4)	0,70[0,24-2,04]			
	Obese	10(76,9)	3(23,1)	0,87[0,27-2,73]			
<b>Tobacco use</b>	No	132(65.0)	71(35.0)	1	0.833	-	-
	Yes	86(66.2)	44(33.8)	0.95[0.60-1.51]			
<b>Practice of physical activity</b>	No	185(64.5)	102(35.5)	1	0.335	-	-
	Yes	33(71.7)	13(28.3)	0.71[0.36-1.42]			
<b>Comorbidities associated with diabetes</b>	No	66(54,0)	57(46,0)	1	0,005	1	<10 <sup>-3</sup>
	Yes	132(62,8)	78(37,2)	1,44[1,11-1,86]			
<b>Clinical data on diabetes</b>							
	T1D	64(71.1)	26(28.9)	1	0.187	-	-
	T2D	154(63.4)	89(36.6)	1.42[0.84-2.41]			
<b>Duration of diabetes (Years)</b>	< 10	130(65.3)	69(34.7)	1	0.948	-	-
	≥ 10	88(65.7)	46(34.3)	0.99[0.62-1.56]			
<b>Diabetes family history</b>	No	63(58.9)	44(41.1)	1	0.082	-	-
	Yes	155(68.6)	71(31.4)	0.66[0.41-1.06]			
<b>Treatment modalities</b>	Lifestyle and dietary measures only	5(41.7)	7(58.3)	1	0.053	-	-
	Antidiabetic drugs	110(65.5)	58(34.5)	1 [0.64-1.57]			
	Insulin (alone or combined with antidiabetic drugs)	141(69.8)	61(30.2)	1.62[1.39-1.98]			
<b>Therapeutic compliance</b>	No	51(81.0)	12(19.0)	1	0.004	-	-
	Yes	167(61.9)	103(38.1)	1.62[1.34-1.85]			
<b>Diabetes complications</b>	No	125(61.3)	79(38.7)	1	0.043	1	0.041
	Yes	93(72.1)	36(27.9)	1.61[1.38-1.99]			
<b>Glycemic Balance</b>	≥ 8%	105(75.5)	34(24.5)	1	0.005	-	-
	7 to 8%	74(58.3)	53(41.7)	1.66[1.05-2.64]			
	≤ 7%	39(58.2)	28(41.8)	0.45 [0.28-0.73]			
<b>Therapeutic education</b>	No	124(68.9)	56(31.1)	1	0.154	-	-
	Yes	94(61.4)	59(38.6)	1.39[0.88-2.19]			
<b>Glycemic self-monitoring</b>	No	145(65.0)	87(35.0)	1	0.809	1	0.007
	Yes	73(66.4)	37(33.6)	0.94[0.58-1.63]			
<b>Foot care</b>	No	205(65.9)	106(34.1)	1	0.413	-	-
	Yes	12(57.1)	9(42.9)	0.94[0.58-1.63]			
<b>Regular medical follow-up</b>	No	126(75.4)	41(24.6)	1	<10 <sup>-3</sup>	1	<10 <sup>-3</sup>
	Yes	92(55,4)	74(44,6)	2,47[1,55-3,94]			

%; relative frequency, AOR: adjusted odds ratio, CI: 95% confidence interval at 95%, BMI: body mass index, n: number, OR: odds ratio, ps 5%

## DISCUSSION

Our findings demonstrated that diabetes patients' quality of life, as determined by the DHP-18, was impaired. The three areas of the questionnaire, psychology, daily activity and diet were all impacted by this impairment. Risk factors were female gender, comorbidities associated with diabetes, diabetes complications and irregular medical follow-up.

The DHP-18 was used in our study to assess the quality of life of diabetic patients with T1DM or T2DM and to identify risk factors for poor quality of life. Studies that have been published in Tunisia have either employed standardized data collection tools or have focused on a specific form of diabetes [19, 20]. However, the convenience

sampling technique chosen in our study was likely to induce a selection bias, which does not permit us to expand our results to all Tunisian diabetic patients. The DHP-18 self-administration to diabetic patients was also likely to include self-report bias. Comparing our findings to those from published series was challenging due to the uniqueness of the inclusion criteria for participants and the variety of techniques used to evaluate quality of life, as well as the geographic, racial, economic, and sociocultural differences amongst populations. We have decided to compare our findings with those of studies carried out in North Africa and the Middle East, that is, in populations with comparable geographical, ethnic, economic, and socio-cultural features, in order to lessen the impact of these inequalities [6,19-24] (Table 4).

**Table 4.** Main studies evaluating the quality of life of diabetic patients in North Africa and the Middle East during the last decade

Study	Country	Year of the study	Population studied	Data collection	Quality of life	Associated factors	Risk factors
ABOU OTHMAN et al. [21]	Morocco	2014	135 T2D	SF-12	Impaired	Age /Gender/ Level of education/ Occupation / Medical insurance/ diabetes-related comorbidities /Glycemic balance/ Self-care measure/ dietary measures /Diabetes acute and degenerative complications.	
EI EMRANI et al.[22]	Morocco	2016	385 T1DM T2DM	SF-36	Impaired	Age >55 years /Female gender.	-
HAMDI et al. [22]	Tunisia	2016	60 T1DM T2DM	ADDQOL	Impaired	Diabetic retinopathy	-
YAZIDI et al. [23]	Tunisia	2018	100 T1DM	ADDQOL	Impaired	Age ≥33 years /Low-income status/ Long-standing diabetes/ Low dose of daily insulin/ Treatment with human insulin/ Hospitalizations/Hypoglycemia/ Diabetic nephropathy and retinopathy/Glycemic imbalance / Irregular follow-up.	Glycemic imbalance / Low dose of daily insulin.
JARAB et al. [24]	Jordanie	2019	160 T2DM	EQ-5D	Impaired	Female gender/ Primary and secondary level of education / Profession outside the medical field / Low monthly income / Polypharmacy / Insulin therapy / Diabetes complications.	Female gender/ Old diabetes / Polypharmacy/ Insulin therapy.
BEN AMOR et al. [19]	Tunisia	2021	204 T2DM	SF-36	Impaired		Advanced age/ Female gender/ Low level of education/ Low income status, Duration of diabetes/ Unbalanced diabetes/ Presence of nephropathy or diabetic retinopathy/ Insulin therapy/ Polypharmacy
HAOUES et al. [6]	Tunisia	2023	186 T1DM 821 T2DM	DHP-18	Impaired -		Female gender/Age < 40 years /Insulin therapy /A low level of knowledge about diabetes.
Our study	Tunisia	2023	90 T1DM 243 T2DM	DHP-18	Impaired	Female gender/ Comorbidities associated with diabetes / Insulin injection/ Therapeutic non-compliance/ Diabetes complications/ Glycemic imbalance/Irregular follow-up.	Female gender/ Comorbidities associated with diabetes/ Diabetes complications/ Irregular follow-up.

T1DM: Type 1 diabetes, T2DM: Type 2 diabetes, SF-12: 12-item Short Form Health Survey, SF-36: Medical Outcomes Study Short-Form General Health Survey, ADDQL: Audit of Diabetes-Dependent Quality of Life, EQ-5D: EuroQoL-5 dimension, DHP-18: Diabetes Health Profile-18



In our study, female gender was a risk factor for impaired quality of life in diabetic patients (AOR= 1.7;  $p=0.005$ ) (Table 3). Diabetes does not affect men and women in the same way. It exposes women to more metabolic and cardiovascular repercussions because of its frequent association with obesity, which is largely predominant in women from the age of puberty in North African countries [21, 22]. The association between obesity and diabetes in women increases the risk of developing cardiovascular disease earlier [25, 26]. On the other hand, diabetic women run specific risks such as gestational diabetes, complications during pregnancy or childbirth, the increased risk of repeated urinary and genital infections, affecting her sexual life, and even complications at menopause [25, 26]. Diabetes-related comorbidities impaired the quality of life of diabetic patients (AOR= 1.23;  $p<10^{-3}$ ) in our study (Table 3). In fact, comorbidities such as obesity, dyslipidemia, and hypertension are common in diabetic patients and are known to be risk factors for the development of diabetes-related complications [27]. These conditions can cause further physical limitations and discomfort that can negatively affect a diabetic patient's quality of life [27].

Our study results showed that diabetes complications impaired diabetic patients' quality of life (AOR= 1.45;  $p=0.041$ ) (Table 3). Diabetes complications, such as neuropathy, nephropathy, retinopathy, and cardiovascular diseases, can significantly affect the quality of life of diabetic patients. A meta-analysis of 48 articles on the frequency of complications in Tunisian T2DM patients showed that the most frequent complications were retinopathy (26.3% to 33.1%) and neuropathy (23.5 to 59.6%), followed by cardiovascular complications (8.8% to 21.5%) and nephropathy (3.4% to 11.6%) [28]. These complications had variable repercussions on the state of health and quality of life of diabetic patients [19, 20]. According to a study based on data from the "Global Burden of Diseases" of the Institute for Health Evaluation and Metrology relating to mortality in the countries of the Great Maghreb, diabetes was the fourth main cause of death, regardless of age and gender [29].

Insulin therapy is a common treatment for diabetes that can significantly improve glycemic control and prevent diabetes-related complications. However, it can influence the quality of life of individuals with diabetes due to the burden of injections and potential adverse effects such as hypoglycemia, weight

gain, and injection site reactions [20, 30]. This fact was observed through our study which demonstrated that insulin therapy was a factor associated with impaired quality of life in diabetic patients (OR= 1.62;  $p=0.039$ ) (Table 3).

In our study, glycemic imbalance ( $p=0.005$ ) and non-compliance with treatment (OR=1.62;  $p=0.004$ ) altered diabetic patients' quality of life (Table 3). Glycemic imbalance is a common problem among diabetic patients that can have a significant impact on their quality of life. When blood sugar levels are not adequately controlled, diabetic patients may experience hyperglycemia or hypoglycemia, both of which can cause a range of symptoms that affect daily life [31]. Hyperglycemia can lead to fatigue, increased thirst and urination, and a higher risk of developing diabetic complications such as neuropathy and retinopathy. Hypoglycemia, on the other hand, can cause dizziness, confusion, and in severe cases, seizures or loss of consciousness. These symptoms can be frightening and disruptive to a patient's daily routine [31].

Although regular medical follow-up is crucial for the management of diabetes and the prevention of diabetes-related complications [32], diabetic patients did not visit their therapist regularly and did not follow their check-up appointments, which affected their quality of life (AOR= 1.45;  $p<10^{-3}$ ) (Table 3). In Tunisia, as in many other low- and middle-income countries, irregular medical follow-up is a common problem among diabetic patients [20, 27]. When diabetic patients do not attend regular follow-up appointments with their healthcare providers, they may miss important screenings or adjustments to their treatment plan, which can lead to complications and a reduced quality of life [32]. Additionally, regular blood sugar monitoring and medication adjustments can help prevent hyperglycemia and hypoglycemia, which can cause a range of symptoms that affect daily life. By attending regular follow-up appointments, diabetic patients can stay on top of their condition and receive the necessary care and support to manage their diabetes effectively [32].

Glycemic self-monitoring, which involves regular monitoring of blood glucose levels by diabetic patients themselves, is an important tool for diabetes management and glycemic control [33]. This parameter was considered as a protective factor against quality of life impairment of diabetic patients in our study (AOR= 0.44;  $p=0.007$ ) (Table 3). By regularly monitoring their blood sugar levels,

diabetic patients can make informed decisions about their diet, exercise, and medication management to maintain optimal glycemic control. Self-monitoring also allows patients to identify patterns in their blood sugar levels [33]. They can reduce the risk of complications associated with glycemic imbalances, such as neuropathy and retinopathy, and improve their overall quality of life [33].

### CONCLUSION

In Tunisia, diabetes mellitus is a critical health issue that has a negative effect on patients' quality of life. Through this study, we were able to identify the female gender, diabetes-related comorbidities, complications from diabetes, and irregular medical follow-up as risk factors for the quality of life impairment of Tunisian diabetic patients. Other studies are conceivable aimed at acting effectively on them. Efforts should be made to prevent and manage diabetes and its complications. This includes lifestyle modifications, regular check-ups and increased awareness and education. The quality of life for patients with diabetes may also be improved by increased access to care and patient support.

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