Journal of Chemical Health Risks

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JCHR (2024) 14(6), 2309-2319 | ISSN:2251-6727

Health-Related Quality of Life in Algerian Patients with Type 1 Diabetes: A Retrospective Cross-Sectional Study

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(Received: 16 September 2024 Revised: 11 October 2024 Accepted: 11 December 2024)

KEYWORDS

Type 1 diabetes, Quality of life, Depression, Glycemia, Sociodemographic

ABSTRACT:

Background: the present cross-sectional observational study aimed to evaluate the health-related quality of life and check for the relationship between depression and glycemia among patients with insulin-dependent diabetes mellitus.

Methods: twenty-six diabetic patients, eight males and eighteen females of broad-range ages (18-73 years old) admitted for consultation with their treating physicians were recruited over five months (December 2018 to April 2019). After filling out a sociodemographic datasheet, patients were introduced to two questionnaires, namely the Short Form-36 and the Patient Health Questionnaire-9. Glycemic measures were obtained from a timely medical check-up upon arrival of nine patients for consultation.

Results: categorical analysis showed that age significantly affects pain sensitivity and general health status, while educational level significantly interferes with patients' physical role limitations, general health status, and health change. Rates of mild, moderate, moderately severe, and severe depression were 50%, 15.38%, 19.23%, and 15.38%, respectively. However, no significant association was found between the sociodemographic variable and this mood disorder. A strong, positive correlation (ρ = 0.866) was uncovered between depression and glycemic values, as represented by mild and moderate levels. This correlation falls within the acceptable range of reliability (Cronbach's alpha value = 0.66), indicating a pertinent clinical significance.

Conclusions: depending on age and educational grade, diabetic patients are prone to excessive sensitivity to pain, inability to perform the usual physical activity, and inadequate health-state self-perception. Depression appears to occur at different levels of severity in all patients, whose glycemic rates can significantly increase when that mood disorder gets worse over time.

1. Introduction

Diabetes mellitus (DM) is a major public health issue that has been considered an epidemic with a significant expansion. It is among the priority non-communicable diseases recognized by the World Health Organization (WHO) as a global threat to health, affecting expectedly 578 million people in 2030 [1, 2]. With its prevalence ever increasing, DM imposes a weighty social and economic burden due to its complications such as cardiovascular disabilities, chronic renal failure, and retinopathy. In Algeria, DM has been classified alongside chronic pathologies that account for a significantly higher mortality rate among all age groups. This African country counted approximately 4.4 million and 4.8 million diabetic patients in 2012 and 2015, respectively. Otherwise, DM is substantially involved in high morbidity within the Algerian working population and is considered one of the main reasons for

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hospitalization, especially among the elderly [3]. In a recent report, the International Diabetes Federation (IDF) estimates the prevalence of this disease in Algeria to be 7.2% among adult people only [4].

Insulin-dependent diabetes mellitus (IDDM), or type 1 diabetes, is the most apparent type of DM, as it suddenly emerges in early childhood with distinct symptoms, including frequent urination (polyurea), excessive thirst (polydipsia), overwhelming hunger, unintentional weight loss, and unusual fatigue. Patients with IDDM develop chronic hyperglycemia due to the autoimmune destruction of the pancreatic insulin-producing β-cells, thus requiring daily insulin treatment to prevent life-threatening complications. However, even though the necessary insulin therapy is performed, physical complications can appear over time because of recurrent hyperglycemia, which is generally difficult to control in modern societies owing to a wide range of interfering factors such as unbalanced dietary habits, sedentary lifestyles, and social stress [5]. Otherwise, the impact of IDDM is of such magnitude that it affects not only the patient's physical status but also their health-related quality of life (HRQoL), which includes emotional well-being and social functioning. Recent investigations have pointed out that patients with IDDM complain of neuropsychiatric disorders that deteriorate their HRQoL, accounting for more severe somatic intricacies [6]. Both trait and state anxiety have been found to predispose diabetic subjects to higher depressive symptoms, and these overall mood disorders were positively correlated with higher glycated hemoglobin (HbA1c) levels, higher fear of exogenous insulin-induced hypoglycemia, and lower blood glucose monitoring rates [7]. Altogether, poorer HRQoL scores have been reported in diabetic patients suffering from such worse pathophysiological indexes, thus making their illness much less controllable with insulin treatment [8].

Currently, HRQoL relating to chronic diseases is considered a health priority worldwide. The WHO defines HRQoL as an individual's perception of their position in life in the context of the culture and value systems in which they live and about their goals, expectations, standards, and concerns. It is a broad-ranging concept affected in a complex way by the person's physical health, psychological state, personal beliefs, social relationships, and their relationship to salient features of their environment [9]. By this definition, measures of HRQoL aim to integrate as many patients' perceptual aspects as possible, thus strengthening the management of their health issues [10]. Therefore, measures of HRQoL have been developed over the past few decades to better understand the increasing morbidity and mortality indexes in diabetic patients, who are usually submitted to standardized questionnaire-based diagnoses [11]. Nevertheless, how and when psychological complaints in patients with IDDM affect the glycemic status in the course of their lifelong illness is still unclear to date.

To help further address this problem, our study aimed to carry out a clinical trial through valid questionnaires to determine, based on some sociodemographic variables, the extent to which physical and psychological components of HRQoL in diabetic patients are affected. A particular interest is devoted to the relationship between depression and glycemia within this sample population.

2. Methods

Target population: this is a cross-sectional observational study carried out at the Internal Medicine Department of Bouzid Ammar Hospital and the Diabetes Polyclinic House ((EPSP Chahid Boussebsi Omar) of El Kala (El Tarf, Algeria) for five months (from December 2018 to April 2019). Twenty-six (26) adult insulin-dependent diabetic patients of both sexes, admitted for consultation at the Polyclinic or hospitalized at the Hospital, were included. The objectives and method were carefully presented to all patients, who verbally consented to contribute to this clinical investigation before it started. To better control the variables measured, we made sure patients did not suffer gestational diabetes or fatigue-related complications during this study. Furthermore, our target population includes only patients demonstrating a diabetic condition for at least six (6) months.

Sociodemographic variables: the following variables were collected using a sociodemographic datasheet: gender, age, level of education, and duration of illness. The sociodemographic characteristics datasheet was administered to the patients before the questionnaires were introduced. Considered as variables that may affect the emergence of physical and/or neuropsychiatric disorders, these characteristics were taken into account in the statistical analysis of data.

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Short Form-36 Questionnaire: Short Form-36 (SF-36) is a general-purpose questionnaire intended to allow the clinical collection and evaluation of patients' points of view on their state of health. It comprises 36 items which represent eight basic dimensions. The choice of this questionnaire to explore HRQoL in patients is preferred since it is a generic score that has a global approach taking into account comorbidities, thus making the results comparable across research publications over various pathologies [12]. Of note, as SF-36 is reproducible and validated in several languages, we adopted the Arabic version in this study [13]. The calculation of various scores was carried out using a valid online application at http://orthotoolkit.com/sf-36/, allowing the automatic collection of results. Nine parameters (dimensions), each with a score ranging from 0 to 100 % depending on the patient's responses, were deduced: physical functioning, physical role limitations, emotional role limitations, energy/fatigue, emotional well-being, social functioning, pain, general health, and health change.

Patient Health Questionnaire-9: The Patient Health Questionnaire-9 (PHQ-9) is a subscale of the full version of PHQ, a general mental health questionnaire. While full PHQ has three modules that specifically and independently deal with anxiety, somatic disorders, and depression, PHQ-9 contains one module examining depression whose severity is assessed based on nine items. This is a self-administered questionnaire formulated for a target population of at least 18 years old. As such, the frequency of depressive symptoms is estimated over the two weeks preceding its administration to patients. Patients respond to each item by choosing one of the following 4-point Likert scale options: 0 (never), 1 (several days), 2 (more than half the time), or 3 (almost every day) [14]. The calculation of scores was performed using a valid online application at https://www.mdcalc.com/phq-9-patient-health-questionnaire-9/, allowing the automatic collection of results. The aforementioned application produces a score ranging from 0 to 27 corresponding to the following severity scale: mild depression (< 10), moderate depression (between 10 and 14), moderately severe depression (between 15 and 19), and severe depression (≥ 20).

Glycemic evaluation: instant glycemic measures were obtained from nine overnight-fasted patients, whose diabetic condition needed a timely check-up upon arrival for consultation. These analyses take part in a continuous medical follow-up as required by the treating physicians.

Statistical analyses: all data were statistically processed by the Statistical Package for the Social Sciences (SPSS) software (version 24, IBM Co., USA). The Chi-square ($\chi 2$) test was applied to determine the relationship of sociodemographic characteristics with SF-36 and PHQ-9 parameters. Descriptive and cross-tabulation results are presented in tables and expressed as frequencies and percentages. The Spearman rank correlation was further performed to check for relationships between depression levels and glycemic measures. To verify the reliability strength of this correlation, Cronbach's alpha test for internal consistency was run. This latest result is presented in a boxplot graph with the corresponding correlation coefficient rho (ρ). The P value < 0.05 was considered statistically significant.

3. Results

Sample sociodemographic data: sociodemographic data are drawn from all patients and presented in Table 1. Of the 26 patients included in this study, 8 (30.8%) were males and 18 (69.2%) were females. The median age of the sample population was 60 (18-73) years, with most of the patients being 38 years old and over (92.4%). Except for two cases of non-education (7.7%), patients declared having primary (57.7%), intermediate (15.4%), or secondary (11.5%) levels, and only two reached colleges (7.7%). Furthermore, the duration of their diabetic status lies between one and 20 years, with the distribution on a 5-year category basis showing that only 6 (23.1%) patients are considered newly diagnosed, while the remaining 20 (76.9%) patients suffer from this condition for at least 6 years.

Relationship among sociodemographic and SF-36 parameters: Table 2 displays the bivariate associations between sociodemographic variables and SF-36 dimensions. The patient distribution in frequency and percentage is based upon a two-category subscale of each item: scores ranging from 0 to 50 are considered low, while scores over 50 are judged high. Our results show that gender is not likely to affect any of the SF-36 item scores. Contrariwise, age was found to significantly impact the perception of pain (P = 0.004) and general health status (P = 0.024). Interestingly, patients aged 48-57 years old reported that they have a good sense of their

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general health. However, they feel sensitive to pain, while older patients over 68 years stated that they doubt their health status despite a reduced worry about pain. Educational level was also found to significantly interfere with patients' perception of role limitations due to physical problems (P = 0.013), general health status (P = 0.048), and health change over time (P = 0.011). A particular observation is that patients with a primary educational level, regardless of their age, do not complain of high physical role limitations (80%), feel good about their general health (80%), and do not perceive so much health change in their life (100%). However, the majority of patients with intermediate grades significantly report that they suffer from high physical role limitations (75%), but all of them (100%) feel good about their general health while ignoring any health change due to their diabetic condition. Otherwise, despite the noticeable differences in the distribution of patients among categories, the duration of illness was not found to affect SF-36 scores at all significantly.

Table 1: sociodemographic characteristics of diabetic patients

Characteristics	n = 26 (100%)
Gender	
Male	8 (30.8%)
Female	18 (69.2%)
Age	
18-27 years	1 (3.8%)
28-37 years	1 (3.8%)
38-47 years	2 (7.7%)
48-57 years	6 (23.1%)
58-67 years	10 (38.5%)
68-77 years	6 (23.1%)
Level of education	
Non-educated	2 (7.7%)
Primary level	15 (57.7%)
Intermediate level	4 (15.4%)
Secondary level	3 (11.5%)
College	2 (7.7%)
Duration of illness	
1-5 years	6 (23.1%)
6-10 years	10 (38.5%)
11-15 years	5 (19.2%)
16-20 years	5 (19.2%)

Sociodemographic characteristics were collected using a patient sociodemographic datasheet. Data are presented as frequency (n) and percentage (%).

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Table 2: inferential statistical analysis of SF-36 dimensions with different sociodemographic variables.

Variables	Physical functioning n (%)		Physical role limitations n (%)		Emotional role limitations n (%)		Energy/Fatigue n (%)	
	Low	High	Low	High	Low	High	Low	High
Gender	*P* = 0.410		*P* = 0.148		*P* = 0.522		*P* = 0.378	
Male	3 (37.5)	5 (62.5)	5 (62.5)	3 (37.5)	5 (62.5)	3 (37.5)	3 (37.5)	5 (62.5)
Female	10 (55.5)	8 (44.5)	12 (66.7)	6 (33.3)	14 (77.8)	4 (22.3)	13 (72.3)	5 (27.7)
Age	*P* = 0.720		*P* = 0.069		*P* = 0.097		*P* = 0.090	
18-27 years	0 (0)	1 (100)	1 (100)	0 (0)	1 (100)	0 (0)	0 (0)	1 (100)
28-37 years	0 (0)	1 (100)	0 (0)	1 (100)	1 (100)	0 (0)	1 (100)	0 (0)
38-47 years	0 (0)	2 (100)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)
48-57 years	2 (33.3)	4 (66.7)	2 (33.3)	4 (66.7)	3 (50.0)	3 (50.0)	2 (33.3)	4 (66.7)
58-67 years	7 (70.0)	3 (30.0)	7 (70.0)	3 (30.0)	7 (70.0)	3 (30.0)	7 (70.0)	3 (30.0)
68-77 years	4 (66.7)	2 (33.3)	6 (100)	0 (0)	6 (100)	0 (0)	5 (83.3)	1 (16.7)
Level of education	*P* = 0.227		*P* = 0.013		*P* = 0.203		*P* = 0.057	
None	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	2 (100)	0 (0)
Primary	11 (73.3)	4 (26.7)	12 (80.0)	3 (20.0)	14 (93.3)	1 (6.7)	13 (86.6)	2 (13.4)
Intermediate	0 (0)	4 (100)	1 (25.0)	3 (75.0)	2 (50.0)	2 (50.0)	0 (0)	4 (100)
Secondary	1 (33.3)	2 (66.7)	2 (66.7)	1 (33.3)	1 (33.3)	2 (66.7)	1 (33.3)	2 (66.7)
College	0 (0)	2 (100)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	0 (0)	2 (100)
Duration of illness	*P* = 0.491		*P* = 0.388		*P* = 0.813		*P* = 0.310	
1-5 years	1 (16.7)	5 (83.3)	4 (66.7)	2 (33.3)	4 (66.7)	2 (33.3)	2 (33.3)	4 (66.7)
6-10 years	6 (60.0)	4 (40.0)	7 (70.0)	3 (30.0)	8 (80.0)	2 (20.0)	6 (60.0)	4 (40.0)
11-15 years	2 (40.0)	3 (60.0)	2 (40.0)	3 (60.0)	3 (60.0)	2 (40.0)	3 (60.0)	2 (40.0)
16-20 years	4 (80.0)	1 (20.0)	4 (80.0)	1 (20.0)	4 (80.0)	1 (20.0)	5 (100)	0 (0)

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Table 2 (Continued)

Variables	Emotional wellbeing n (%)		Social functioning n (%)		Pain n (%)		General Health n (%)		Health change n (%)	
	Low	High	Low	High	Low	High	Low	High	Low	High
Gender	*P* = 0.175		*P* = 0.660		*P* = 0.394		*P* = 0.324		*P* = 0.153	
Male	3 (37.5)	5 (62.5)	4 (50.0)	4 (50.0)	2 (25.0)	6 (75.0)	4 (50.0)	4 (50.0)	8 (100)	0 (0)
Female	10 (55.5)	8 (44.5)	7 (39.0)	11 (61.0)	10 (55.5)	8 (44.5)	11 (61.0)	7 (39.0)	17 (94.4)	1 (5.6)
Age	*P* = 0.901		*P* = 0.097		*P* = 0.004		*P* = 0.024		*P* = 0.050	
18-27 years	0 (0)	1 (100)	0 (0)	1 (100)	1 (100)	0 (0)	0 (0)	1 (100)	1 (100)	0 (0)
28-37 years	0 (0)	1 (100)	0 (0)	1 (100)	0 (0)	1 (100)	0 (0)	1 (100)	1 (100)	0 (0)
38-47 years	0 (0)	2 (100)	0 (0)	2 (100)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)
48-57 years	1 (16.7)	5 (83.3)	0 (0)	6 (100)	1 (16.7)	5 (83.3)	2 (33.3)	4 (66.7)	6 (100)	0 (0)
58-67 years	6 (60.0)	4 (40.0)	6 (60.0)	4 (40.0)	5 (50.0)	5 (50.0)	7 (70.0)	3 (30.0)	10 (100)	0 (0)
68-77 years	6 (100)	0 (0)	5 (83.3)	1 (16.7)	4 (66.7)	2 (33.3)	5 (83.3)	1 (16.7)	6 (100)	0 (0)
Level of education	*P* = 0.245		*P* = 0.535		*P* = 0.368		*P* = 0.048		*P* = 0.011	
None	0 (0)	2 (100)	0 (0)	2 (100)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)	1 (50.0)
Primary	12 (80.0)	3 (20.0)	9 (60.0)	6 (40.0)	9 (60.0)	6 (40.0)	12 (80.0)	3 (20.0)	15 (100)	0 (0)
Intermediate	1 (25.0)	3 (75.0)	1 (25.0)	3 (75.0)	0 (0)	4 (100)	0 (0)	4 (100)	4 (100)	0 (0)
Secondary	0 (0)	3 (100)	1 (33.3)	2 (66.7)	2 (66.7)	1 (33.3)	1 (33.3)	2 (66.7)	3 (100)	0 (0)
College	0 (0)	2 (100)	0 (0)	2 (100)	0 (0)	2 (100)	1 (50.0)	1 (50.0)	2 (100)	0 (0)
Duration of illness	*P* = 0.292		*P* = 0.508		*P* = 0.212		*P* = 0.367		*P* = 0.517	
1-5 years	1 (16.7)	5 (83.3)	2 (33.3)	4 (66.7)	2 (33.3)	4 (66.7)	3 (50.0)	3 (50.0)	5 (83.3)	1 (16.7)
6-10 years	7 (70.0)	3 (30.0)	6 (60.0)	4 (40.0)	3 (30.0)	7 (70.0)	5 (50.0)	5 (50.0)	10 (100)	0 (0)
11-15 years	2 (40.0)	3 (60.0)	1 (20.0)	4 (80.0)	3 (60.0)	2 (40.0)	3 (60.0)	2 (40.0)	5 (100)	0 (0)
16-20 years	3 (60.0)	2 (40.0)	2 (40.0)	3 (60.0)	4 (80.0)	1 (20.0)	4 (80.0)	1 (20.0)	5 (100)	0 (0)

Pearson chi-square (χ^2) test was used for statistical analysis. Data are presented as frequency (n) and percentage (%).

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JCHR (2024) 14(6), 2309-2319 | ISSN:2251-6727

Relationship among sociodemographic and PHQ-9 parameters:

Among this sample population, the rate of mild, moderate, moderately severe, and severe depression was 50%, 15.38%, 19.23%, and 15.38%, respectively. Based on gender, severe depressive signs were found in one male (12.5%) and three females (16.7%). In contrast to females, no males had scores relating to moderate depression. Patients aged from 18 to 47 years old expressed mild to moderate depression levels. Within the 48-57-year-old category, most of the patients reported mild depressive scores (83.3%); only one patient showed a moderately severe level (16.7%). In patients aged 58 and over, severe depressive symptoms emerged in 4 out of 16 patients (25%). Non-educated patients, as well as those of intermediate and college grades, were found to express mild depression. However, patients of primary and secondary grades had scores extending to moderately severe depression, with 4 out of 15 primary-level patients suffering severe depressive signs. Furthermore, newly diagnosed patients had mild depression, except in one case (16.7%) showing moderately severe symptoms. Patients experiencing diabetic conditions for more than 5 years were found to be depressed at different levels of severity, but no patient in the 11-15 years category exhibited the highest depressive scores. Nevertheless, despite these variations in depressive scores among patients, no statistically significant association was revealed between sociodemographic variables and PHQ-9 depression levels (Table 3).

Table 3: inferential statistical analysis of PHQ-9 levels of depression with different sociodemographic variables

Variable	Level of depression n (% within variable)			
	Mild	Moderate	Moderately severe	Severe
Gender	$P = 0.493$			
Male	5 (62.5)	0 (0)	2 (25.0)	1 (12.5)
Female	8 (44.4)	4 (22.2)	3 (16.7)	3 (16.7)
Age	$P = 0.423$			
18-27 years	0 (0)	1 (100)	0 (0)	0 (0)
28-37 years	1 (100)	0 (0)	0 (0)	0 (0)
38-47 years	2 (100)	0 (0)	0 (0)	0 (0)
48-57 years	5 (83.3)	0 (0)	1 (16.7)	0 (0)
58-67 years	4 (40.0)	2 (20.0)	2 (20.0)	2 (20.0)
68-77 years	1 (16.7)	1 (16.7)	2 (33.3)	2 (33.3)
Level of education	$P = 0.363$			
Non-educated	2 (100)	0 (0)	0 (0)	0 (0)
Primary	4 (26.7)	3 (20.0)	4 (26.7)	4 (26.7)
Intermediate	4 (100)	0 (0)	0 (0)	0 (0)
Secondary	1 (33.3)	1 (33.3)	1 (33.3)	0 (0)
College	2 (100)	0 (0)	0 (0)	0 (0)
Duration of illness	$P = 0.488$			
1-5 years	5 (83.3)	0 (0)	1 (16.7)	0 (0)
6-10 years	4 (40.0)	2 (20.0)	1 (10.0)	3 (30.0)
11-15 years	3 (60.0)	1 (20.0)	1 (20.0)	0 (0)
16-20 years	1 (20.0)	1 (20.0)	2 (40.0)	1 (20.0)

Pearson chi-square (χ^2) test was used for statistical analysis. Data are presented as frequency (n) and percentage (%).

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JCHR (2024) 14(6), 2309-2319 | ISSN:2251-6727

Relationship among depression levels and glycemic measures:

Only patients with timely reliable glycemic measures were kept in this analysis. We checked a total of nine patients with a glycemic mean of 2.68 ± 0.54 g/L corresponding to either mild (5 patients) or moderate (4 patients) depression levels. The Spearman rank correlation analysis uncovered a strong, positive correlation between glycemic measures and the severity of depression ($\rho = 0.866$, $P = 0.003$). Though the sample size for this analysis is small, Cronbach's alpha test for internal consistency sets out a value of 0.66, thus reflecting acceptable reliability (Fig. 1).

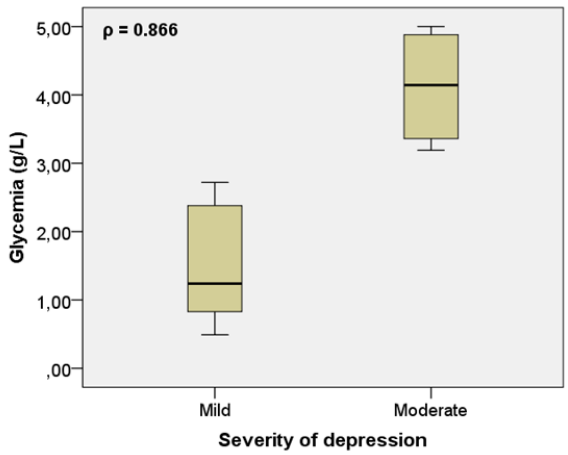

Figure 1: correlation of depression levels with glycemic measures in diabetic patients. Data are presented as a boxplot graph showing the minimum value, first (lower) quartile, median, third (upper) quartile, and maximum value. Rho (ρ) is the Spearman rank correlation coefficient.

Discussion

According to the IDF Diabetes Atlas (9th Edition), IDDM occurs in 33.1 thousandths among Algerian children and adolescents up to 19 years old, and the overall age-adjusted prevalence of impaired glucose tolerance (IGT) among Algerian diabetic adults (20-79 years old) is estimated to be 6% in 2019 [4]. These estimates demonstrate that the Algerian population is at high risk for this chronic illness and its complications, and highlight the urgent need for clinical investigations relating to HRQoL to determine the disease-promoting factors. In our study, women count for 69.2% of the sample population, but this gender majority does not mean that females are more likely to get IDDM than males. Even so, some previous reports indicated that women are more sensitive to this chronic disease, thus experiencing less satisfaction with their well-being due to more concerns about deadly complications [15]. Nevertheless, our investigation did not find significant gender effects on SF-36 scores. Contrariwise, our findings show that age and educational level can significantly interfere with HRQoL. The age range of patients is associated with their pain sensitivity and general health status scores, while educational level has a strong influence on their physical role limitations, general health status, and health change scores. While it is still unclear as to how age range and educational level interact with IDDM outcomes, previous research has pointed out that higher pain perception impairs HRQoL indicators, whereas higher physical activity ameliorates them [16, 17]. These effects may find a plausible explanation in the fact that diabetic patients can experience relentless pain in their lower extremities, which in turn overwhelms their usual physical activities and, in severely affected individuals, prohibits their walking outright [18]. Using the PHQ-9 questionnaire, our data reveal that all patients expressed some level of depression severity, with half of them being mildly affected. This means that subjects with IDDM are very likely to develop mood disorders regardless of their age, duration of illness, and social status. Furthermore, even though sociodemographic variables were not significantly associated with depression, severe PHQ-9 scores were uncovered in four patients aged 58 and over, thus indicating that mild depressive signs may get worse as patients get older, a fact that does not appear to depend on how long the diabetic condition is present. Regarding educational level, patients severely depressed have all reached primary grade at most, but this is unlikely to interfere with susceptibility to severe depression because such severity was not registered in non-educated subjects nor those reaching higher grades including college. Another interesting finding in our trial lies in the fact that glycemic rates positively correlate with depression severity; that is, moderately depressed patients have significantly higher glycemic levels than those measured in mildly depressed counterparts. Though this finding is only based on two out of four levels of depression severity and accounts for nine among 26 patients studied,

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JCHR (2024) 14(6), 2309-2319 | ISSN:2251-6727

it implies a pertinent clinical significance as statistically justified by acceptable reliability. It has been reported that diabetic subjects up to 50 years old have better HRQoL scores than older subjects who complain of poor self-perception and, therefore, lower HRQoL indexes [19]. Another study including 60 diabetic patients aged 18-59 years old pointed out a statistically significant difference with healthy counterparts in terms of the general health perception and energy/vitality domains of SF-36. Interestingly, based on 15 patients only, a significant correlation was found between glycemic control, assessed by glycated hemoglobin (HbA1c) levels, and the energy/vitality domain [20]. Concerning this latter finding, a large population-based, retrospective, cross-sectional study suggested that better glycemic surveillance could positively impact the HRQoL of individuals with IDDM, in such a manner that each 1% reduction in HbA1c may cause the scores of general health status, as evaluated by EuroQoL questionnaires, to increase by 1.5 points [21]. Other determinants of HRQoL in diabetic subjects have also been found to considerably affect glycemia-related variables, thus making the clinical control of the whole condition difficult to achieve. For instance, using the Diabetes Quality of Life-Youth (DQOL-Youth) questionnaire, a long time since the first diagnosis was significantly associated with a lower total score among 96 adolescents with IDDM. Of particular note, HbA1c levels higher than 7% were found in 81% of them, a physiological sign of poor glycemic control that significantly contributed to lowering the total score as well [22]. Therefore, the cumulative effect of multiple interfering factors on HRQoL in diabetic patients is worth exploring, a reason that prompted us to associate broadly-physical/psychological parameters (SF-36) with specific depression-based items (PHQ-9) in our investigation. Furthermore, though HbA1c has been a powerful indicator of glycemic control over the past 2-3 weeks, we assumed that instant glycemic measures upon application of questionnaires would greatly avoid biases caused by daily psychosocial factors. Otherwise, depression is still less identifiable by clinicians than general emotional complaints such as recurrent fear and worry, even though several screening questionnaires currently used in primary care help practitioners distinguish depressed patients from non-depressed counterparts at any moment of their disease course, thus focusing on the treatment of this comorbidity at its earlier stages to avoid significant repercussions on insulin-based glycemic control. Effectively, prior studies indicated that individuals with both diabetes and depression can incur poor glycemic control, probably resulting in more severe complications and, therefore, much lower HRQoL scores [23, 24]. Accordingly, it was reported that PHQ-9 is a very useful tool for screening depression among diabetic patients, whose disease prognosis would considerably be enhanced if this mood disorder is detected and treated at the earliest [25].

4. Conclusion

Based on our aforementioned results, we can state that adult patients with IDDM are prone to excessive sensitivity to pain, inability to perform the usual physical activity, and inadequate health-state self-perception. These physical and psychological outcomes were found to depend on age and educational level. All patients of this sample population show signs of depression at different levels of severity regardless of the sociodemographic characteristics considered. This impactful comorbidity is thought to significantly impair glycemic rates even under the best adherence of patients to insulin therapy.

Acknowledgments

We thank Bouzid Ammar Hospital's staff for their technical assistance.

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