

Aleksandra Jaworska-Czerwińska<sup>1</sup>, Marta Lewicka<sup>2</sup>

Nicolaus Copernicus University in Torun, Collegium Medicum in Bydgoszcz, Faculty of Health Sciences, Department of Preventive Nursing, Bydgoszcz, Poland

# Functioning of patients with type 2 diabetes mellitus

## Corresponding author:

Aleksandra Jaworska-Czerwińska  
 Nicolaus Copernicus University  
 in Torun, Collegium Medicum  
 in Bydgoszcz, Faculty of Health  
 Sciences, Department of Preventive  
 Nursing, Bydgoszcz, Poland  
 Łukasiewicza 1 St, 85-821 Bydgoszcz  
 e-mail: ola\_jaworskaczerwinska@o2.pl

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## ABSTRACT

**Introduction:** Type 2 diabetes mellitus is a chronic lifestyle condition that affects the lives of millions of people worldwide. This study aimed to assess the functioning of patients with type 2 diabetes using the Functioning in the Chronic Illness Scale. The study's objective encompassed an analysis of the correlation between patients' functionality and their level of illness acceptance.

**Material and methods:** This study used a self-developed questionnaire that collected clinical and sociodemographic data and the Functioning in the Chronic Illness Scale (FCIS), a standardized tool used among 104 patients diagnosed with type 2 diabetes who were treated at a diabetic clinic. To verify whether the level of functioning in the examined subjects was associated with the level of illness acceptance, the Acceptance of Illness Scale (AIS) was utilized.

**Results:** The mean FCIS score was  $88.24 \pm 11.45$ , indicating medium functioning. The study also showed that older patients were less likely to believe that they had a real effect on their health and the disease itself ( $p < 0.001$ ). These analyses showed that respondents with a high level of illness acceptance maintained a high level of functioning in the disease ( $p < 0.001$ ).

**Conclusions:** Regular assessment of individuals with type 2 diabetes and identification of factors that impact their living may help select treatment methods, plan of care and strengthen the sense of responsibility for their own health, especially in older patients.

**Keywords:** patient; diabetes mellitus; functioning of a patient

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## Introduction

One of the most important epidemiological trends of our time is the increase in the incidence of chronic and degenerative diseases. Chronic conditions, including diabetes, require long-term treatment, resulting in a greater demand for healthcare services and a change in the nature of the latter. Dependency on long-term care may lead to deterioration of quality of life in older patients [1].

Over the past few years, we have witnessed significant advancements in the pharmacotherapy of diabetes. Besides metformin, a drug that has been used for decades now, flozins are a first-line treatment in newly diagnosed type 2 diabetes mellitus (T2DM) [2]. However, first-line treatment in patients with high cardiovascular risk should include sodiumglucose

co-transporter-2 (SGLT2) inhibitors or glucagon-like peptide-1 receptor agonists (GLP-1RAs) [3]. These help significantly delay the initiation of insulin therapy [2,3].

Repeat measurements of blood glucose levels using a glucometer are becoming increasingly replaced with continuous glucose monitoring (CGM) systems. In Poland, starting from January 1, 2024, individuals diagnosed with type 2 diabetes mellitus requiring thrice-daily insulin injections (intensive insulin therapy) are given the opportunity to utilize one of these systems under reimbursement provisions [4]. These systems allow diabetic patients to keep track of their blood glucose levels in real time, where glucose data are stored in the cloud and sent to an app to be viewed on handheld devices such as mobile phones or smartwatches. Predictive low glucose alerts that notify patients before they reach their low glucose limits help prevent severe hypoglycemia

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and improve patient safety [5]. Type 2 diabetes is a chronic condition that requires lifestyle change, taking medication as prescribed, continuous monitoring of glycemia, and following a well-balanced diet and other doctor's recommendations on the part of the patient. However, it is the patient's personality, willingness to maintain health-related behaviors, acceptance of the disease, coping with stress, and social support that impact the patient's attitude toward the disease [6].

## Aim

This study assessed the functioning of patients with type 2 diabetes using the Functioning in the Chronic Illness Scale (FCIS), a standardized tool. The study's objective encompassed an analysis of the correlation between patients' functionality and their level of acceptance, employing the Acceptance of illness Scale (AIS) for evaluation.

## Material and methods

The survey questionnaires were administered to 104 adults diagnosed with type 2 diabetes who were treated at the Diabetic Clinic of Jan Biziel University Hospital No. 2 in Bydgoszcz. The study was conducted in compliance with the Declaration of Helsinki from July to November 2023 with the approval of the Bioethics Committee of the Nicolaus Copernicus University functioning at Collegium Medicum in Bydgoszcz (KB 249/2023). Data were obtained from a self-developed questionnaire designed to collect sociodemographic and clinical data (comorbidities, disease duration, glycemic control methods, and treatment) and from the Functioning in the Chronic Illness Scale (FCIS) [7].

The FCIS by Aldona Kubica was developed to identify deficits in the functioning of a patient with a chronic disease. This is vital from the viewpoint of appropriate therapeutic interventions. The FCIS questionnaire consists of 3 subscales and evaluates the impact of the disease on the patient, the patient's impact on the disease, and the impact of the disease on the patient's attitudes. The sum of the scores for all three subscales gives the total FCIS score. A score in the top range means that the patient functions very well in the disease, whereas a score in the bottom range indicates poor functioning of the patient in the disease. To analyze the relationship between the two scales, a standardized questionnaire of the Acceptance of Illness Scale (AIS) [8] was used.

## Data analysis

Tests for significance of differences and correlation coefficients were also used in the analysis. The normality of the distribution of the data collected from respondents was checked using the Shapiro-Wilk's test. Differences in two populations in terms of a given quantitative variable were assessed using the Mann-Whitney U test. Spearman's rank correlation was used to examine the correlation of two variables that did not meet the criterion of normality of distribution and ordinal variables. For quantitative variables with a normal distribution, Pearson's  $r$  correlations were used. Student's  $t$  test for one sample was used to check whether the level of acceptance of the disease corresponds to the norm for diabetics. Statistical analysis was performed using IBM SPSS Statistics 23. Results were considered significant at  $p$ -value < 0.05.

## Sociodemographic characteristics of the study population

The study sample involved 104 individuals, of which 68 were women (65.4%) and 36 were men (34.6%). The mean age of the sample was 66.45 years ( $\pm$  10.37), and most respondents were aged 61–70 years (42.3%). In the sample, 46 respondents (44.3%) had high school education, 23 respondents (22.1%) had vocational education, and 24 subjects (23.1%) had higher education. The study sample included 70 retirees (67.35%), 23 professionally active individuals (22.1%), 10 disability pensioners (9.6%), 2 subjects with a part-time job, and one student. The majority of the respondents were diagnosed with T2D within 11–20 years (33.7%) or 6–10 years and within 5 years (26%) prior to the study. In 2023, 4.8% of the respondents were diagnosed with T2DM. Comorbid diseases occurred in 72% of the respondents, half of whom had hypertension. According to the questionnaire, 43.3% of the respondents had a family history of diabetes. Usually, the condition occurred in the parents of the respondents and less often in their children, siblings, grandparents, or extended family. 33 subjects (31.7%) were using insulin administered subcutaneously. Forty respondents (39.40%) followed a well-balanced diet and used weight reduction to improve their blood glucose levels.

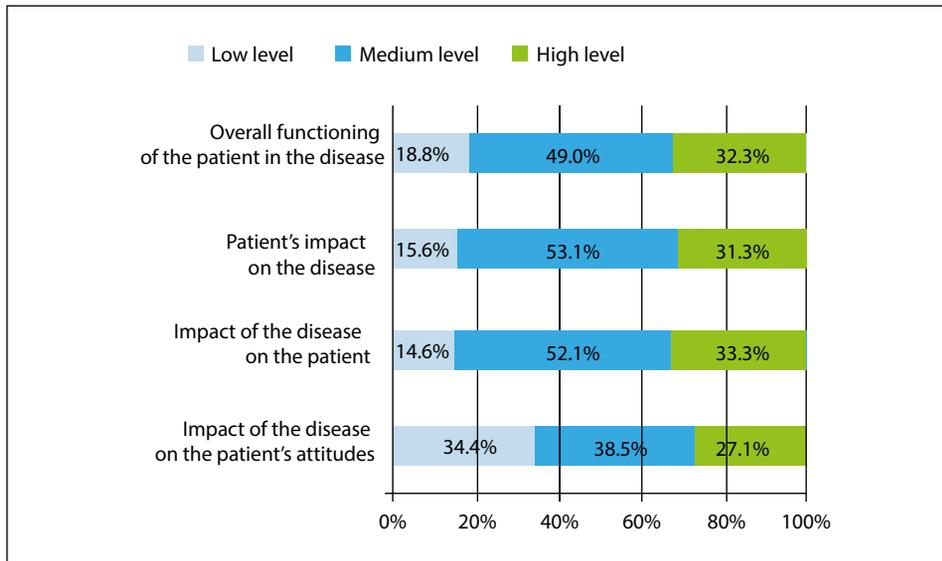
## Results

The overall functioning of patients with the disease was assessed using the FCIS questionnaire. The respondents' scores ranged from 58 to 109, with a mean

**Table 1.** Descriptive statistics for the FCIS

	Min	Max	M	SD	Me	Sk	K	p	$\alpha$
Overall functioning of the patient in the disease	58	109	88.24	11.45	87	-0.22	-0.37	0.149	0.84
Impact of the disease on the patient	8	40	30.01	6.00	31	-0.75	0.83	0.004	0.83
Patient's impact on the disease	20	36	28.20	3.36	28	-0.16	0.00	0.197	0.32
Impact of the disease on the patient's attitudes	14	40	30.03	5.03	30	-0.32	0.06	0.158	0.78

Min — minimum, Max — maximum, M — mean, SD — standard deviation, Me — median, Sk — skewness, K — kurtosis, p — significance according to the Shapiro — Wilk test,  $\alpha$  — Cronbach's Alpha,

**Figure 1.** Scale levels for the overall functioning of patients in the disease

of  $88.24 \pm 11.45$  and half of them scoring 87 on this scale. Then, on the subscale measuring the impact of the disease on the patient, the respondents' scores ranged from 8 to 40, with a mean of  $30.01 \pm 6$ . The impact of the patient on the disease ranged from 20 to 36, with a mean of  $28.20 \pm 3.36$ . The impact of the disease on the patient's attitude ranged from 14 to 40, with a mean of  $30.03 \pm 5.03$ . Descriptive statistics are shown in Table 1.

The analysis of the Shapiro–Wilk test of normality showed that, the distribution of the scales measuring the patient's functioning in the disease was not significantly different from a normal distribution ( $p > 0.05$ ). The respondents obtained a high reliability of answers in the questionnaire except for the subscale measuring the patient's impact on the disease  $\alpha = 0.32$ ; therefore, the results should be interpreted with caution.

The distribution of respondents with low, medium, and high variables was determined according to the standards set by the author for the scales measuring

the functioning of a patient in the chronic disease. The distribution of the results is shown in Figure 1.

Pearson's  $r$  correlation analysis was used to examine the relationship between the AIS and FCIS results. The findings are shown in Table 2. These analyses showed a statistically significant correlation between the AIS results and the overall functioning of the patient with the disease in the study sample ( $r = 0.43$ ;  $p < 0.001$ ) and with the subscales measuring the impact of the disease on the patient ( $r = 0.51$ ;  $p < 0.001$ ) and the impact of the disease on the patient's attitudes ( $r = 0.36$ ;  $p < 0.001$ ). The correlations were positive, indicating that respondents with a high level of illness acceptance maintained a high level of functioning in the disease. No statistically significant correlation was found between the acceptance of illness and the impact of the patient on the illness ( $r < 0.001$ ;  $p = 0.973$ ). Of note, the level of illness acceptance in the study sample was statistically different ( $t = 5.37$ ;  $df = 103$ ;  $p < 0.001$ ) from the norm set for patients with diabetes. On average, the

level of illness acceptance in the study sample was  $M = 30.17$  ( $SD = 9.62$ ), with the norm set for this scale at  $M = 24.81$ .

A series of analyses using the Mann-Whitney  $U$ -test were conducted to compare the functioning of patients in the disease, considering selected factors. These factors were not statistically significant ( $p > 0.05$ ) in the overall functioning of patients in the disease. Thus, no statistical differences were found by gender ( $p = 0.954$ ), comorbidities ( $p = 0.116$ ), well-balanced diet and weight reduction ( $p = 0.418$ ), or pharmacotherapy ( $p = 0.236$ ) with insulin injections ( $p = 0.507$ ). No significant differences were observed for individual subscales ( $p > 0.05$ ).

Table 3 shows the results of Spearman's  $\rho$  correlation analyses (highly skewed distribution) for the relationship between the patient's functioning in the disease and age, education and disease duration. These results were not statistically significant for the

relationship with disease duration and education ( $\rho = -0.09$ ,  $p = 0.386$  and  $\rho = -0.03$ ,  $p = 0.803$ , respectively). A statistically significant relationship was found only between the age of the respondents and the impact of the patient on the disease ( $\rho = -0.37$ ;  $p < 0.001$ ). The relationship was negative, meaning that older respondents were less likely to believe that they had a real impact on their health and the disease itself (Table 3).

## Discussion

This study aimed to assess the functioning of patients with type 2 diabetes using the Functioning in the Chronic Illness Scale (FCIS). Answers obtained from the study patients showed a medium level of functioning in the disease both in the overall functioning and in other subscales. Thus, the scale was found to be useful for assessing the functioning of patients with T2DM.

The study evaluated the influence of selected factors on the results of the FCIS questionnaire, including gender, age, education, duration of the disease, occurrence of comorbidities, use of a balanced diet and weight reduction, and use of pharmacotherapy (including insulin injections). A statistically significant relationship was found only between the age of the respondents and the impact of the patient on the disease subscale – older patients are less likely to believe that they have real effect on the disease and their own health. Age as a studied variable did not significantly affect the results in the assessment of overall functioning and for other subscales. Similar results were obtained by Pazderska, where age, gender, level of education, or place of residence also did not affect the quality of life of the respondents ( $n = 53$ ) [9].

**Table 2.** Results of Pearson's correlation analyses between the Acceptance of Illness Scale (AIS) and the Functioning in the Chronic Illness Scale (FCIS)

		Acceptance of illness
Overall functioning of the patient in the disease	$r$	0.43
	$p$	< 0.001
Impact of the disease on the patient	$r$	0.51
	$p$	< 0.001
Patient's impact on the disease	$r$	< 0.001
	$p$	0.973
Impact of the disease on patient's attitudes	$r$	0.36
	$p$	< 0.001

$r$  — the Pearson's  $r$  statistic,  $p$  — statistical significance

**Table 3.** Results of Spearman's  $\rho$  correlation analyses for the relationship between the patient's functioning in the disease and age, education, disease duration

		Age	Education	Disease duration
Overall functioning of the patient in the disease	$\rho$	-0.16	-0.03	-0.09
	$p$	0.124	0.803	0.386
Impact of the disease on the patient	$\rho$	-0.02	0.06	-0.06
	$p$	0.839	0.572	0.557
Patient's impact on the disease	$\rho$	-0.37	0.01	0.07
	$p$	< 0.001	0.951	0.497
Impact of the disease on patient's attitudes	$\rho$	-0.14	-0.12	-0.2
	$p$	0.172	0.267	0.056

$\rho$  — the Spearman's  $\rho$  statistic,  $p$  — statistical significance

The results of this study were compared with those obtained by Tomala in 2021r. using the FCIS questionnaire. The author mainly investigated the impact of treatment methods (i.e., patients treated with insulin vs. those treated with medications) on the level of functioning of patients in a chronic disease. Her study showed that patients treated with insulin functioned better in the disease than those treated with medications; however, it did not show any correlation with any of the analyzed factors (i.a., gender, age, education) [10]. In the present study, the impact of the selected factors on the functioning of patients was also found to be statistically insignificant.

On the other hand, a Brazilian study by Reis et al., which included 100 respondents, showed that patients taking insulin had a lower quality of life, yet noted physical and emotional discomfort associated with the use of insulin to control blood glucose levels, a more advanced stage of the disease, and more comorbidities [11].

The study also demonstrated a positive relationship between the AIS and FCIS for overall functioning and the impact of the disease on the patient and the impact of the disease on the patient's attitudes subscales. It should be noted that the study patients showed greater acceptance of illness than the norm set for individuals with T2DM, which was not the case in the study results obtained by other authors who studied quality of life. Rogon et al. conducted a study among 100 patients diagnosed with type 2 diabetes from Wielkopolska Province in Poland and found that more than half of the female and male respondents did not accept their illness; however, younger patients were more likely to accept the illness than older patients [12]. A lack of acceptance of illness affects self-esteem and increases patient dependence on others. Coming to terms with the limitations associated with the disease will help the patient develop motivation, set goals, and overcome the difficulties associated with the illness [12–14].

## Conclusion

The overall functioning of patients treated at the diabetic clinic was medium. Pharmacological advancements in the pharmacotherapy of T2DM, prevention of its complications, and technological progress may improve the quality of life and functioning of patients with T2DM. Hence, there is a need for continued needs assessment of individuals diagnosed with T2DM, which is a proper measure of effective treatment.

## Limitations

The main limitation of the study is the small number of respondents surveyed and the fact that the study was conducted only in one clinic where patients with type 2 diabetes are treated. Due to the anonymous nature of the study, another limitation was the inability to compare the answers given with the actual health condition of the respondents.

## Article information

**Data availability statement:** *Data are available on request from the corresponding author.*

**Ethics statement:** *The study was conducted in compliance with the Declaration of Helsinki from July to November 2023 with the approval of the Bioethics Committee of the Nicolaus Copernicus University functioning at Collegium Medicum in Bydgoszcz no.249/2023.*

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**Supplementary material:** *None*

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