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Quality of Life in Patients with Type 2 Diabetes Mellitus and Degenerative Changes of the Spine

Jakość życia chorych z cukrzycą typu 2 i zmianami zwyrodnieniowymi kręgosłupa

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Abstract

Introduction. Diabetes mellitus (DM), as a group of metabolic syndromes, is characterised by hyperglycaemia caused by a defect in insulin secretion and/or action. Osteoarthrosis is a disease that results in a slow degenerative process of joint surfaces. Predisposing factors for the disease include age, obesity, posture defects, metabolic diseases, injuries, and so-called mechanical factors such as occupational work. One of the causes of degenerative changes is type 2 diabetes mellitus.
Aim. The aim of this paper was to determine the level of quality of life and the impact of degenerative spine changes on the quality of life in patients with type 2 diabetes mellitus.
Material and Methods. The study was conducted on a group of 115 individuals of both genders staying in a rehabilitation ward. The study used standardised tools to assess pain, cervical and lumbar spine disability, a questionnaire to assess basic activities of daily living and a scale to assess quality of life. Sociodemographic data were obtained from patients' medical records.
Results. A total of 106 fully completed questionnaires (99.07%) were included in the analysis, comprising 52 (48.60%) women and 54 (50.47%) men. All respondents (N=107) experienced pain symptoms. According to the ADL scale, most respondents were fully functional. According to the ODI scale, the largest group indicated moderate disability. According to the NDI scale, the groups of patients with no disability, mild disability, and moderate disability were comparable, with severe disability affecting 7.48% of patients, and extreme suffering and disability affecting 2.80% of the study group. The mean quality of life score was 3.5±0.76 points, meaning that the respondents rated their quality of life between good and average (neither good nor bad). The mean self-health assessment score was 2.54±0.78 points, indicating that the respondents rated their health between unsatisfactory and average (neither satisfactory nor unsatisfactory). Respondents rated their quality of life highest in the social relationship domain (14.42±2.55), slightly lower in the psychological domain (14.38±2.33), followed by the environment domain (13.77±2.11), and lowest in the physical domain (11.24±2.51).
Conclusions. The quality of life assessment of patients with T2DM and degenerative spine changes is at a fairly good level. Factors influencing the quality of life of these patients include age, marital status, occupational activity, and intensity of pain. All patients in the study suffer from moderate spinal pain. Most patients are able to function independently in daily life. **(JNNN 2025;14(1):16–26)**
Key Words: degenerative spine changes, pain, quality of life, type 2 diabetes mellitius

Streszczenie

Wstęp. Cukrzyca (DM), jako grupa zespołów metabolicznych charakteryzuje się hiperglikemią spowodowaną defektem w wydzielaniu i/lub działaniu insuliny. Osteoartrosis — to choroba w wyniku której następuje powolny proces degeneracyjny powierzchni stawowych. Czynnikami predysponującymi do wystąpienia choroby jest wiek, otyłość wady postawy, choroby metaboliczne, urazy oraz tzw. czynniki mechaniczne — praca zawodowa. Jedną z przyczyn występowania zwyrodnień jest cukrzyca typu 2.

Cel. Celem pracy było określenie poziomu jakości życia i wpływu zmian zwyrodnieniowych kręgosłupa na jakość życia u chorych z cukrzycą typu 2.
Materiał i metody. Badania przeprowadzono na grupie 115 osób obojga płci przebywających na oddziale rehabilitacji. W badaniu wykorzystano narzędzia standaryzowane do oceny bólu, niesprawności kręgosłupa w odcinku szyjnym i lędźwiowym, kwestionariusz do oceny podstawowych czynności dnia codziennego oraz skalę do oceny jakości życia. Dane socjodemograficzne uzyskano z dokumentacji medycznej pacjentów.
Wyniki. Do analizy włączono 106 poprawnie wypełnionych kompletnych ankiet (99,07%) osób w tym: 52 (48,60%) kobiet i 54 (50,47%) mężczyzn. Wszyscy respondenci (N=107) odczuwali dolegliwości bólowe. Według skali ADL większość badanych charakteryzuje pełna sprawność. Według skali ODI największa grupa wskazała na umiarkowaną niesprawność. Według skali NDI grupy pacjentów z brakiem niepełnosprawności, łagodną niepełnosprawnością i umiarkowaną niepełnosprawnością są porównywalne, ciężka niesprawność dotyczy 7,48% chorych, a skrajne cierpienie i niesprawność 2,80% badanej grupy. Średnia ocena jakości życia wynosi 3,5±0,76 punktu, co oznacza, że badani oceniają jakość życia pomiędzy dobrą a przeciętną (ani dobra ani zła). Średnia ocena własnego zdrowia wynosi 2,54±0,78 punktu, co oznacza, że badani oceniają swoje zdrowie pomiędzy niezadowalającym a przeciętnym (ani zadowalającym ani niezadowalającym). Badani najlepiej oceniają swoją jakość życia w dziedzinie socjalnej (14,42±2,55), nieco gorzej wypada jakość życia w dziedzinie psychologicznej (14,38±2,33), następnie w dziedzinie środowiskowej (13,77±2,11), a najgorzej jakość życia w dziedzinie fizycznej (11,24±2,51).
Wnioski. Ocena jakości życia pacjentów z T2DM i zmianami zwyrodnieniowymi kręgosłupa jest na dość dobrym poziomie. Na jakość życia tych chorych ma wpływ wiek, stan cywilny, aktywność zawodowa, stopień nasilenia dolegliwości bólowych. Wszyscy badani pacjenci cierpią na dolegliwości bólowe kręgosłupa o umiarkowanym stopniu nasilenia. Większość badanych jest w stanie samodzielnie funkcjonować w życiu codziennym. **(PNN 2025;14(1):16–26)**
Słowa kluczowe: zmiany zwyrodnieniowe kręgosłupa, dolegliwości bólowe, jakość życia, cukrzyca typu 2

Introduction

Diabetes mellitus (DM), as a group of metabolic syndromes, is characterised by hyperglycaemia caused by a defect in insulin secretion and/or action [1], and represents a serious global health threat. Unfortunately, diabetes leads to severe complications, which can result in disability and even death. Diabetes affects 463 million people worldwide and 60 million in Europe. In European countries, the disease affects 8.9% of the population aged 20 to 79. In this population, type 2 diabetes mellitus accounts for 90% of all cases, and the prevalence of the disease increases with age [2].

Osteoarthrosis is a disease that results in a slow degenerative process of joint surfaces. It leads to an impairment of the structure and function of the affected joint, pain, restricted mobility, and, ultimately, even disability [3]. Both inflammatory and non-inflammatory changes, as well as biological, biomechanical, metabolic, and immunological factors, are responsible for the onset of degenerative changes. These changes can affect all joint structures, including articular cartilage, subchondral bone layers, the joint capsule, synovial membrane, and periarticular structures [4]. According to experts' definition, osteoarthrosis belongs to a group of disorders that, despite different aetiologies, lead to similar morphological, biological, and clinical changes. The disease results in softening, fibrillation, and ulceration of the articular cartilage, as well as sclerosis and densification of the subchondral bone tissue, with the formation of osteophytes and cysts [3]. Degenerative changes most commonly occur in joints that bear body weight, mainly the knee, hip, cervical, and lumbar spine. Osteoarthrosis is classified as a non-inflammatory disease, but it is often accompanied by a secondary inflammatory reaction. Numerous mediators of the inflammatory process participate in the pathomechanism of the changes [5]. Patients do not experience pain at the onset of the disease; it only appears when the joint capsule, synovial membrane, subchondral bone layer, periosteum, muscles, and ligaments become involved in the disease process. For this reason, it is often diagnosed at a later stage [6]. Clinically, the disease is characterized by chronic pain with periodic flare-ups, morning stiffness, and restricted joint mobility. In the early stages, pain occurs periodically after exertion, being most bothersome at the end of the day, along with gradually progressing movement limitations. There are pain flare-ups with local tenderness and contracture that subside after a few days. The pain, restricted joint mobility, muscle atrophy, stiffness, and contractures cause significant discomfort in patients' daily functioning, ultimately leading to impaired mobility and premature disability [7]. Predisposing factors for the disease include age, obesity, posture defects, metabolic diseases, injuries, and so-called mechanical factors such as occupational work [8]. Available literature indicates that diabetes mellitus promotes the development of degenerative changes in joints, including the spine. Although it is generally accepted that these symptoms related to pain in degenerative spinal conditions result from micro- and macrovascular pathophysiology, the full extent of the effects of long-term hyperglycaemia is not yet fully understood [9].

Studies available in the literature have demonstrated a link between hyperglycaemia and biochemical changes that may underlie intervertebral disc degeneration [10],

thereby providing a potential mechanism through which diabetes may contribute to back pain associated with spinal degeneration [11,12]. Furthermore, these findings suggest that the likelihood of back pain may increase as the disease progresses [13]. Individuals with diabetes may experience various musculoskeletal issues that can lead to discomfort, pain, and dysfunction, thereby negatively impacting their primary treatment and worsening their quality of life [14].

In the course of osteoarthritis of the spine, several types of pain can be distinguished: nociceptive pain from the musculoskeletal-ligamentous system, neuropathic pain, including neurogenic claudication, psychogenic pain, and other chronic pain loosely related to the degenerative process of the spine.

In recent years, there has been significant development of a new approach to treatment that focuses on patients' quality of life. Due to the prevalence, course, and consequences of osteoarthritis, it has become a focus of interest for researchers in the field of quality of life, and it is subjected to numerous analyses and measurements. Quality of life is seen as one of the forms of assessing life satisfaction. A holistic approach plays a significant role here, involving not only an analysis of physical problems, such as pain, but also psychological and social aspects. This provides a comprehensive assessment of the patient's health, which directly contributes to quality of life [15]. Chronic diseases, including diabetes mellitus and osteoarthritis, are associated with physical and psychological discomfort, severely limiting a person's functioning. Pain associated with degenerative changes in the spine can trigger anxiety, depression, or neurosis. The pain results in significant functional impairment and a decrease in quality of life. The disease most often leads to a reduction in the ability to perform activities of daily living. Dependence on others and difficulty in carrying out tasks independently negatively affect self-esteem and self-worth. The degenerative changes and resulting limitations hinder previous lifestyle, affect social interactions, family and professional life. The disease lowers social status, often necessitating the cessation of work, which in turn worsens the family's material conditions, significantly affecting the deterioration of quality of life. Therefore, the disease presents a difficult situation for the patient and is also a stress-inducing factor. Negative emotions, such as fear, deterioration of mood, anxiety and depression, increase the perception of pain, creating a vicious circle [16,17].

Due to its prevalence and risk of complications, diabetes mellitus represents a significant health and social problem. It is a chronic condition that requires long-term and multifaceted treatment. Chronic pain caused by degenerative conditions related to diabetes mellitus, lifestyle changes, lack of sufficient knowledge about prevention and complications, poor mental health, and prolonged treatment without the expected improvement contribute to the lack of acceptance of the disease and a decline in quality of life.

The aim of this paper was to determine the level of quality of life and the impact of degenerative spine changes on the quality of life in patients with type 2 diabetes mellitus.

Material and Methods

The study was conducted on a group of 115 individuals of both genders staying in the rehabilitation ward at the hospital on Poświęcka Street 8 in Wrocław, between July 2019 and November 2021, after obtaining written consent from the head of the ward. Before starting the study, each patient was informed about the purpose and the voluntary and anonymous participation in the study.

Inclusion Criteria for the Study

Age of participants 55–65 years, at least 10 years since the diagnosis of type 2 diabetes mellitus, no history of psychiatric disorders that could affect the quality of the research tools, consent to participate in the study.

The study used standardised tools to assess pain, cervical and lumbar spine disability, a questionnaire to assess basic activities of daily living and a scale to assess quality of life. Sociodemographic data were obtained from patients' medical records.

VAS (Visual Analogue Scale) — a scale used to assess pain intensity. The scale takes the form of a 10 cm ruler, ranging from 0 to 10, where 0 represents no pain and 10 represents the most severe pain imaginable [18].

ODI Scale (Oswestry Disability Index) — a tool used to assess the level of disability in patients with thoraco-lumbar spine pain syndromes. NDI Scale (Neck Disability Index) — focuses on pain in the cervical spine region and the associated functional limitations in various areas of life. The questionnaires consist of 10 sections: 2 related to pain and 8 related to daily activities. Responses are graded from 0 to 5. The total score is presented either as a point scale from 0 to 50 or as a percentage from 0 to 100%, determining the degree of disability [19].

ADL Scale (Activities of Daily Living) — used to assess the patient's independence in performing tasks such as maintaining hygiene, dressing and undressing, eating, moving, and controlling basic physiological functions. The score ranges from 0 to 6: 5–6 indicates full functionality, 3–4 indicates moderate disability, below 2 indicates severe disability [20].

WHOQoL-BREF Questionnaire — it consists of 26 questions and enables an assessment of quality of life in 4 domains of life: physical, psychological, social relationships and environment. The scale also includes questions for separate analysis concerning individual and overall assessments of quality of life and self-health. Responses are scored from 1 to 5. A higher score indicates a better quality of life [21–23].

Statistical Methods

The analysis of quantitative variables (i.e. expressed as numbers) was performed by calculating the mean, standard deviation, median, quartiles, minimum and maximum. The analysis of qualitative variables (i.e., non-numerical) was conducted by calculating the number and percentage of occurrences for each value. A comparison of quality of life between two groups was performed using the Student's t-test (when quality of life followed a normal distribution in these groups) or the Mann–Whitney's test (otherwise). Correlations between quality of life and quantitative variables were analysed using Pearson's correlation coefficient (when both had a normal distribution) or Spearman's (otherwise). The strength of the relationship was interpreted as follows: $|r| \geq 0.9$ — very strong, $0.7 \leq |r| < 0.9$ — strong, $0.5 \leq |r| < 0.7$ — moderately strong, $0.3 \leq |r| < 0.5$ — weak, $|r| < 0.3$ — very weak (negligible). The normality of variable distributions was tested using the Shapiro–Wilk test. A significance level of 0.05 was adopted, meaning all p-values below 0.05 were interpreted as indicating significant relationships. The analysis was performed using the R software, version 3.5.1.

The study group characteristics are presented in Table 1.

Table 1. Characteristics of the study group

Variable	N	%
1	2	3
Gender		
Women	52	48.60
Men	54	50.47
No answer	1	0.93
Age		
Up to 60 years	30	28
Over 60 years	77	72
Place of residence		
Country	77	71.97
City	29	27.10
No answer	1	0.93
Marital status		
Single	43	40.2
In a relationship	64	59.8
Professional activity		
Employed	29	28
Unemployed	77	72
Type of work		
Blue-collar job	19*	65.5*
White-collar job	10*	34.5*
Are you experiencing any pain?		
Yes	107	100
No	0	0

*group of professionally active respondents

A total of 106 correctly and completely filled out questionnaires (99.07%) were included in the analysis, with 52 women (48.60%) and 54 men (50.47%). One person did not respond to this question (0.93%). The minority of respondents were under 60 years old, 30 individuals (28.04%), while the majority were over 60 years old, 77 individuals (71.96%). The majority of respondents lived in the city, 77 people (71.97%), while 29 (27.10%) lived in the country, and 1 person (0.93%) did not answer this question.

Among the respondents, the majority, 63 people (59.2%), were in a relationship, while 43 people (40.2%) were single. In the study group, 76 people (72%) were not employed, with a minority of 29 people (28%) being employed.

Of those who were employed, more than half (65.5%) were blue-collar workers (19 people), and 10 individuals (34.5%) were white-collar workers.

Study Results

All respondents (N=107) experienced pain symptoms. The mean pain intensity was 7.02±1.13 points on a 0–10 scale, ranging from 5 to 9 points. The median was 7 points, meaning half of the respondents rated their pain at 7 points or less, and the other half rated it at 7 points or more. The first and third quartiles were 6 and 8 points, respectively, indicating that typical pain intensity in the study group ranged from 6 to 8 points (Table 2).

According to the ADL scale, 2 respondents (1.87%) had significant disability, 5 (4.67%) had moderate disability, and 100 people (93.46%) had full functionality (Table 3).

Table 2. Pain intensity on the VAS scale

Pain intensity			
N	$\bar{x}$	SD	Me
106*	7.02	1.13	7

*one respondent did not specify the intensity of pain; N — number of observations; $\bar{x}$ — mean; SD — standard deviation; Me — median

Table 3. Assessment of basic activities of daily living-ADL

ADL — score	Interpretation	N	%
0–2	Severe disability	2	1.87
3–4	Moderate disability	5	4.67
5–6	Full functionality	100	93.46

N — number of observations; % — percent

According to the ODI scale, 14 respondents (13.08%) had mild disability, 44 had moderate disability (41.12%), severe disability was present in 33 respondents (30.84%), and extreme pain and disability affected 16 respondents (14.95%) (Table 4). According to the NDI scale, 29 respondents (27.10%) had no disability, 30 respondents (28.04%) had mild disability, 37 respondents (34.58%) had moderate disability, 8 respondents (7.48%) had severe disability, and 3 respondents (2.80%) experienced extreme pain and disability (Table 4).

Table 4. ODI and NDI disability assessment

Points	Interpretation	ODI		NDI	
		N	%	N	%
0–4	No disability	0	0.00	29	27.10
5–14	Mild disability	14	13.08	30	28.04
15–24	Moderate disability	44	41.12	37	34.58
25–34	Severe disability	33	30.84	8	7.48
35–50	Extreme suffering and disability	16	14.95	3	2.80

N — number of observations; % — percent

Results of the Quality of Life Survey with the WHOQoL-BREF Questionnaire

Perception of Quality of Life and Health

The mean quality of life score was 3.5±0.76 points, meaning that the respondents rated their quality of life between good and average (neither good nor bad). The mean self-health assessment score was 2.54±0.78 points, indicating that the respondents rated their health between unsatisfactory and average (neither satisfactory nor unsatisfactory).

WHOQoL-BREF Quality of Life Domains

Respondents rated their quality of life best in the social relationships domain (14.42±2.55), slightly worse in the psychological domain (14.38±2.33), then in the environment domain (13.77±2.11), and worst in the physical domain (11.24±2.51) (Table 5). Analysis of the impact of sociodemographic factors on quality of life (Table 6).

Table 5. Perception of quality of life and health and assessment of quality of life in individual domains (N=107)

WHOQoL-BREF	$\bar{x}$	SD	Me
Perception of quality of life	3.5	0.76	4
Perception of health	2.54	0.78	3
Physical domain	11.24	2.51	11
Psychological domain	14.38	2.33	15
Social relationships domain	14.42	2.55	15
Environment domain	13.77	2.11	14

$\bar{x}$ — mean; SD — standard deviation; Me — median

In the studied group, only quality of life in the social relationships domain depended significantly on age (as $p<0.05$), with individuals under 60 having a higher quality of life. No significant relationships were found between gender or place of residence and quality of life. Respondents in relationships had better psychological and environmental quality of life than single individuals (since $p<0.05$).

The perception of quality of life and health, as well as quality of life in the physical and psychological domains, significantly depend on employment status (as $p<0.05$), with employed individuals having higher quality of life. There were no significant relationships (all $p>0.05$) between the type of work performed and quality of life.

Analysis of the impact of pain, spinal disability according to ODI and NDI, and functionality according to ADL on quality of life based on the WHOQoL-BREF Questionnaire (Table 7).

The perception of quality of life and health and quality of life in the physical, psychological and environment domains correlate significantly and negatively with pain intensity (as $p<0.05$); thus, the greater the pain, the lower the quality of life in these domains.

The perception of quality of life and health and quality of life in the physical, psychological and environment domains correlate significantly and negatively with the ODI score (as $p<0.05$); therefore, the higher the ODI score (greater disability), the lower the quality of life in these domains.

Table 6. Relationships between variables and quality of life in the study group

WHOQoL-BREF	Variable		
	Age		
	Up to 60 years of age (N=30)	Over 60 years of age (N=77)	p*
Perception of quality of life			
$\bar{x}$±SD	3.53±0.82	3.49±0.74	0.57
Me	4	3	NP
Quartile	3–4	3–4	
Perception of health			
$\bar{x}$±SD	2.7±0.88	2.48±0.74	0.155
Me	3	2	NP
Quartile	2–3	2–3	
Physical domain			
$\bar{x}$±SD	11.73±2.69	11.05±2.43	0.096
Me	11.5	11	NP
Quartile	11–14	9–13	
Psychological domain			
$\bar{x}$±SD	14.8±2.61	14.22±2.22	0.071
Me	15	15	NP
Quartile	14–17	13–15	
Social relationships domain			
$\bar{x}$±SD	15.07±2.26	14.17±2.63	0.045
Me	15.5	15	NP
Quartile	13.5–16	12–16	
Environment domain			
$\bar{x}$±SD	13.4±2.34	13.91±2.01	0.52
Me	14	14	NP
Quartile	12.25–14.75	12–16	

Table 6. Continued

WHOQoL-BREF	Variable		
	Gender		
	Women (N=52)	Men (N=54)	p*
Perception of quality of life			
$\bar{x}$±SD	3.5±0.73	3.52±0.79	0.934
Me	3.5	4	NP
Quartile	3–4	3–4	
Perception of health			
$\bar{x}$±SD	2.54±0.8	2.56±0.77	0.97
Me	3	2.5	NP
Quartile	2–3	2–3	
Physical domain			
$\bar{x}$±SD	11.27±2.37	11.26±2.67	0.096
Me	11	11	P
Quartile	10–13	9–13	
Psychological domain			
$\bar{x}$±SD	14.29±2.51	14.52±2.17	0.614
Me	15	15	P
Quartile	13–16	13–16	
Social relationships domain			
$\bar{x}$±SD	14.71±2.48	14.2±2.6	0.374
Me	15	15	NP
Quartile	12.75–16	12.25–16	
Environment domain			
$\bar{x}$±SD	13.4±2.21	14.13±1.98	0.071
Me	14	14	NP
Quartile	12–15	12–16	

N — number of observations; $\bar{x}$ — mean; SD — standard deviation; Me — median; *P=normal distribution across groups, Student's t-test; NP=non-normal distribution across groups, Mann–Whitney's test

Table 6. Continued

WHOQoL-BREF	Variable: Place of residence		
	City (N=77)	Country (N=29)	p*
Perception of quality of life			
$\bar{x}$±SD	3.55±0.8	3.41±0.63	0.302
Me	4	3	NP
Quartile	3–4	3–4	
Perception of health			
$\bar{x}$±SD	2.6±0.8	2.41±0.73	0.355
Me	3	2	NP
Quartile	2–3	2–3	
Physical domain			
$\bar{x}$±SD	11.48±2.69	10.66±1.93	0.134
Me	11	11	P
Quartile	10–13	10–12	
Psychological domain			
$\bar{x}$±SD	14.57±2.43	13.9±2.06	0.134
Me	15	14	NP
Quartile	13–16	12–15	
Social relationships domain			
$\bar{x}$±SD	14.57±2.59	13.97±2.46	0.261
Me	15	15	NP
Quartile	12–16	13–15	
Environment domain			
$\bar{x}$±SD	13.92±2.04	13.28±2.25	0.234
Me	14	14	NP
Quartile	12–16	12–15	

Table 6. Continued

WHOQoL-BREF	Variable: Marital status		
	Single (N=43)	In a relationship (N=63)	p*
Perception of quality of life			
$\bar{x}$±SD	3.35±0.69	3.62±0.79	0.114
Me	3	4	NP
Quartile	3–4	3–4	
Perception of health			
$\bar{x}$±SD	2.49±0.74	2.57±0.82	0.617
Me	2	3	NP
Quartile	2–3	2–3	
Physical domain			
$\bar{x}$±SD	10.79±2.16	11.56±2.72	0.126
Me	11	11	P
Quartile	9.5–12.5	10–14	
Psychological domain			
$\bar{x}$±SD	13.72±2.34	14.83±2.25	0.032
Me	14	15	NP
Quartile	12–15	13–16	
Social relationships domain			
$\bar{x}$±SD	13.93±2.16	14.78±2.76	0.077
Me	15	15	NP
Quartile	11.5–15.5	13–16	
Environment domain			
$\bar{x}$±SD	13.23±1.99	14.14±2.14	0.016
Me	13	14	NP
Quartile	12–14.5	13–16	

N — number of observations; $\bar{x}$ — mean; SD — standard deviation; Me — median; *P=normal distribution across groups, Student's t-test; NP=non-normal distribution across groups, Mann–Whitney's test

Table 6. Continued

WHOQoL-BREF	Variable		
	Professional activity		
	Employed (N=29)	Unemployed (N=76)	p*
Perception of quality of life			
$\bar{x}$±SD	3.83±0.76	3.39±0.73	0.01
Me	4	3	NP
Quartile	3–4	3–4	
Perception of health			
$\bar{x}$±SD	2.83±0.85	2.42±0.74	0.03
Me	3	2	NP
Quartile	2–3	2–3	
Physical domain			
$\bar{x}$±SD	12.52±2.49	10.75±2.4	0.001
Me	13	11	P
Quartile	11–14	9–12	
Psychological domain			
$\bar{x}$±SD	15.14±2.05	14.09±2.4	0.041
Me	15	14.5	P
Quartile	14–17	12.75–15.25	
Social relationships domain			
$\bar{x}$±SD	15.1±2.54	14.14±2.55	0.062
Me	15	15	NP
Quartile	13–17	12–16	
Environment domain			
$\bar{x}$±SD	14.07±2.19	13.64±2.11	0.346
Me	14	14	NP
Quartile	13–16	12–16	

Table 6. Continued

WHOQoL-BREF	Variable		
	Type of work		
	Blue-collar job (N=16)	White-collar job (N=10)	p*
Perception of quality of life			
$\bar{x}$±SD	3.88±0.5	4.1±0.88	0.441
Me	4	4	NP
Quartile	4–4	3.25–5	
Perception of health			
$\bar{x}$±SD	2.88±0.89	2.9±0.88	1
Me	3	3	NP
Quartile	2–3.25	2–3.75	
Physical domain			
$\bar{x}$±SD	12.38±2.16	13.4±2.8	0.303
Me	12	13.5	P
Quartile	11–14	11.5–15	
Psychological domain			
$\bar{x}$±SD	15.25±1.73	16±1.7	0.435
Me	15.5	15.5	NP
Quartile	14–17	15–17	
Social relationships domain			
$\bar{x}$±SD	15.12±2.42	16.2±2.04	0.255
Me	15	16.5	P
Quartile	14.5–16	15.25–17	
Environment domain			
$\bar{x}$±SD	14.19±1.83	14.8±2.3	0.459
Me	14	15	P
Quartile	13.75–16	14–16	

N — number of observations; $\bar{x}$ — mean; SD — standard deviation; Me — median; *P=normal distribution across groups, Student's t-test; NP=non-normal distribution across groups, Mann–Whitney's test

Table 7. Impact of pain intensity on the quality of life of respondents

WHOQoL-BREF	Correlation with pain intensity			
	Correlation coefficient	p *	Relationship direction	Relationship strength
Perception of quality of life	–0.458	p<0.001 NP	negative	weak
Perception of health	–0.543	p<0.001 NP	negative	mean
Physical domain	–0.626	p<0.001 NP	negative	mean
Psychological domain	–0.382	p<0.001 NP	negative	weak
Social relationships domain	–0.165	p=0.091 NP	–	–
Environment domain	–0.29	p=0.003 NP	negative	very weak
	Correlation with ODI			
Perception of quality of life	p<0.001 NP	negative	mean	p<0.001 NP
Perception of health	p<0.001 NP	negative	mean	p<0.001 NP
Physical domain	p<0.001 NP	negative	mean	p<0.001 NP
Psychological domain	p<0.001 NP	negative	weak	p<0.001 NP
Social relationships domain	p=0.131 NP	–	–	p=0.131 NP
Environment domain	p=0.008 NP	negative	very weak	p=0.008 NP
	Correlation with NDI			
Perception of quality of life	–0.218	p=0.024 NP	negative	very weak
Perception of health	–0.243	p=0.012 NP	negative	very weak
Physical domain	–0.24	p=0.013 NP	negative	very weak
Psychological domain	–0.249	p=0.01 NP	negative	very weak
Social relationships domain	–0.164	p=0.091 NP	–	–
Environment domain	–0.172	p=0.076 NP	–	–
	Correlation with ADL			
Perception of quality of life	0.323	p=0.001 NP	positive	weak
Perception of health	0.057	p=0.559 NP	–	–
Physical domain	0.277	p=0.004 NP	positive	very weak
Psychological domain	0.273	p=0.004 NP	positive	very weak
Social relationships domain	0.07	p=0.474 NP	–	–
Environment domain	0.271	p=0.005 NP	positive	very weak

*P=Normal distribution of both correlated variables, Pearson's correlation coefficient; NP=Non-normal distribution of at least one of the correlated variables, Spearman's correlation coefficient

The perception of quality of life and health and quality of life in the physical, psychological and environment domains correlate significantly and negatively with the ODI score (as p<0.05); therefore, the higher the ODI score (greater disability), the lower the quality of life in these domains.

The perception of quality of life and quality of life in the physical, psychological and environment domains correlate significantly and positively with the ADL disability score (as p<0.05); the higher the ADL score (greater functionality), the higher the quality of life in these domains.

Discussion

Musculoskeletal problems may occur due to the systemic nature of the disease [14]. T2DM can lead to various complications in the skeletal and muscular systems. Some evidence suggests that this may be caused by the macro- and microvascular complications associated with diabetes mellitus. A cross-sectional study by Molsted et al. (2012) found that musculoskeletal pain, including lower back pain, was more common in patients with T2DM compared to the non-diabetic population [24].

The ongoing chronic disease process becomes a source of negative emotions and causes physical discomfort. Untreated changes, or those treated at a late stage, contribute to complications, recurring pain, and disability,

all of which result in reduced quality of life. Patients are often unaware of the consequences of untreated conditions, believing that the symptoms will resolve on their own [25].

Patients suffering from degenerative changes of the spine, regardless of the cause, struggle with pain that evokes fear, anxiety, and a sense of helplessness, thereby reducing their quality of life. These patients fear disability, dependency, and exclusion from life. In our own study, all respondents reported pain, with intensity ranging from 6 to 8 points on the VAS scale. In a study by Miller et al., pain associated with degenerative changes occurred daily or frequently, with moderate to severe intensity [26]. Respondents in a study by Gajewski et al. also reported moderate to severe osteoarticular pain [27]. Similar results were obtained by Kozłowski and Kozłowska in their study of elderly people over 60 years of age, noting that they were more likely to select higher values on the 10-degree VAS pain scale. Spinal pain problems increase with age and with the duration of diabetes mellitus. In the population over 55 years old, the prevalence reaches 98% [28]. In addition to discomfort, pain disrupts the functional ability of respondents. Our own study, using the ODI and NDI questionnaires, shows that lower back pain is more common and creates greater functional problems, affecting 100% of respondents. Similar results were obtained by Lorencowicz et al. in their study. According to Lorencowicz et al., the lumbar spine is most vulnerable to the harmful effects of civilisation progress. Respondents admitted that chronic back pain causes discomfort and hinders the performance of basic activities [29]. These studies confirm that pain is a constant element of osteoarthritis of the spine, and that it limits daily life functioning. It leads to increasing disability and becomes a factor that reduces the assessment of quality of life.

Diabetes mellitus is a chronic and irreversible disease that lasts throughout a person's life. It can affect any age group, is a significant financial burden, affects self-care, and shortens life expectancy due to chronic complications, including those related to the musculoskeletal system [30]. When analysing quality of life in our study, respondents rated quality of life lower than their health status. Respondents rated quality of life in the social relationships domain most favourably, quality of life in the psychological domain somewhat less favourably, and quality of life in the environment and physical domains least favourably. Different results were obtained by Talaga et al., where the physical domain, despite the respondents' health problems, was not rated low, and the psychological domain received the lowest score [8]. In a study by Krzemińska and Kostka, most people with diabetes considered their quality of life to be neither good nor bad, with the lowest quality of life found in the psychological and physical domains [30]. Our own study confirms that age and marital status significantly impact quality of life, especially in the psychological, social relationships, and environment domains. Employment status also plays an important role. Employed individuals had a better perception of both quality of life and health. Kozłowski obtained similar results in his study, where working individuals rated their quality of life higher in all domains compared to non-working individuals [28]. No statistically significant relationships were observed between quality of life and place of residence, gender, or comorbidities. Our study shows that, despite considerable pain and functional disability, respondents did not rate their quality of life too negatively, describing it as good or average. However, problems in performing daily activities undoubtedly affect the quality of life. Self-assessment of health and a high sense of quality of life decrease with increasing disability. Therefore, it is crucial to promote a healthy lifestyle among patients, emphasising self-care and adherence to therapeutic recommendations in diabetes mellitus, and to select appropriate physical activities for each patient, which will improve their functional abilities and independence in daily activities, thereby enhancing their quality of life.

Conclusions

1. The quality of life assessment of patients with T2DM and degenerative spine changes is at a fairly good level.
2. Factors influencing the quality of life of these patients include age, marital status, occupational activity, and intensity of pain.
3. All patients in the study suffer from moderate spinal pain.
4. Most respondents are able to function independently in daily life.

Implications for Nursing Practice

There is a need to promote a healthy lifestyle with particular emphasis on self-care, self-monitoring, adherence to therapeutic recommendations, and the adaptation of individual physical activity guidelines for each patient diagnosed with type 2 diabetes mellitus. Patients should be re-educated at least twice a year, and the education programme should be tailored to individual needs resulting from the progression of the disease and its complications.

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