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Original article

QUALITY OF LIFE OF PATIENTS AFTER TOTAL KNEE ARTHROPLASTY

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Abstract: **Introduction:** Diseases of the musculoskeletal system are common in the general population. They significantly contribute to increased morbidity, more frequent use of healthcare services, reduced working capacity, increased professional absences, and the occurrence of disability.

Methodology: This study involved patients who underwent knee replacement surgery at the Clinical Center of Montenegro, Podgorica. We employed the SF-36, a widely used universal standard questionnaire, which has been applied in over 4,000 published studies.

Results: Statistically significant improvements in quality of life were observed in all examined domains: physical functioning (p = 0.0001), role limitations due to physical problems (p = 0.0001), role limitations due to emotional problems (p = 0.0001), vitality/energy (p = 0.0002), mental health (p = 0.0004), social functioning (p = 0.0001), physical pain (p = 0.0001), and perception of general health (p = 0.0001) following knee endoprosthesis implantation.

Conclusion: Statistically significant differences were observed in all quality of life domains before and after knee endoprosthesis surgery, confirming the improvement in patients' quality of life after the procedure.

Keywordsjesus: knee endoprosthesis, quality of life, disability, working ability.

INTRODUCTION

Knee osteoarthritis is one of the most common joint diseases worldwide, particularly in the elderly population, who often have multiple comorbidities. This condition leads to disability and impairs the mobility of patients, disrupting their normal functioning (1-4). The World Health Organization (WHO) defines quality of life as an individual's personal perception of their objective reality. This includes how the environment affects them in the context of their personal, family, and work environments, the culture and value system in which they live, and in relation to their own goals, needs, expectations, standards, and interests (5, 6, 7). In 2001, the WHO also defined disability as an impairment of body structure and organ function (5). In many countries, the concept of disability has been redefined with the goal of improving quality of life (8, 9, 10).

The human body represents a harmonious, essential entity composed of numerous parts with different functions that interact and complement each other. All living beings share a universal need for movement, as life cannot exist without it. A lack of movement in modern humans leads to various health problems and reduces quality of life (9, 10).

Degenerative, inflammatory, metabolic changes, and post-traumatic conditions can occur in the knee joint. Degenerative changes, particularly in bones and soft tissues, take center stage, leading to changes in mechanical relationships. Excessive cartilage wear has multiple causes, with some of the most significant being knee joint overload, congenital joint deformities, excessive weight, constant strain due to work, and micro-injuries from recreational sports or improper engagement in sports without professional supervision (10).

The most well-known types of osteoarthritis are coxarthrosis (hip joint osteoarthritis) and gonarthrosis (knee osteoarthritis), but osteoarthritis can also affect small joints in the fingers and spine, leading to painful syndromes in the back (9, 11, 12). The knee joint is

particularly vulnerable to osteoarthritis, which can be very unpleasant as it causes pain, limited joint mobility, and significant limitations in daily activities (10, 13).

Quality of life is a concept studied across many scientific disciplines (medicine, physiology, psychology, sociology, etc.). There are numerous definitions of quality of life in medical literature, all emphasizing physical, psychological, and social dimensions. General quality of life provides insights into human aspirations, while health-related quality of life (HRQoL) focuses only on aspects directly related to health. "Health-related quality of life encompasses the physical, psychological, and social domains of health, influenced by human experiences, beliefs, expectations, and perceptions" (14). Reduced quality of life is particularly evident in older individuals, as previously published studies show a strong association with the prevalence of psychosomatic and motor disorders (15).

When considering the determinants of quality of life, physical activity often ranks low on the priority list. However, insufficient physical activity can lead to muscle atrophy, sarcopenia, osteoporosis, and chronic non-communicable diseases, including type 2 diabetes, arterial hypertension, coronary heart disease, obesity, and certain types of cancer. Engaging in properly dosed physical activity and adhering to a balanced diet can help older working-age people maintain their physical and mental fitness, effectively performing their social and professional duties (16).

Aim

To assess the quality of life in patients before and after knee endoprosthesis implantation.

PATIENTS AND METHODS

This study included patients who underwent total knee replacement at the Clinical Center of Montenegro in Podgorica. The research was conducted from April to August 2022 and focused on patients with knee joint disease who were treated surgically. The patients were surveyed about their general and socio-demographic characteristics, as well as their quality of life before surgery and after the implantation of the total knee replacement.

The SF-36 universal standard questionnaire was used in this study, which is widely applied in over 4,000 published studies to assess quality of life in specific populations. This questionnaire collects data on the impact of impaired health on patients' daily lives. It consists of 36 items, each addressing different health aspects. It measures health multidimensionally, including: physical functioning, role limitations due to physical health, bodily pain, social functioning, role limitations due to emotional difficulties, vitality, mental health, and overall self-assessment of health status. A higher score reflects a better self-assessment of health in these areas.

The physical health profile (PCS, Physical Component Summary Measure) includes four of the eight dimensions: physical functioning, role limitations due to physical difficulties, bodily pain, and perception of overall health. The mental health profile (MCS, Mental Component Summary Measure) includes vitality/energy, social functioning, role limitations due to emotional difficulties, and mental health. The SF-36 questionnaire represents an empirically validated operationalization of two general health concepts—physical health and mental health—and their manifestations in functioning and well-being.

Statistical analysis will be performed in collaboration with a statistician, utilizing descriptive and inferential statistics through both parametric and non-parametric tests. The study was approved by the Ethics Committee of KCCG/2021. Participation in the research was voluntary and anonymous, with patients providing informed consent. All procedures were in accordance with institutional and national research ethics standards, as well as the 1964 Helsinki Declaration and its later amendments.

RESULTS

For this study, participants with gonarthrosis of the knee and injuries leading to knee replacement surgery were intentionally selected. Since every patient had an equal chance of participating, this sample is considered a simple random sample. Some general and sociodemographic characteristics of the participants are presented in Table 1. Out of 32 participants, the majority were women (24, or 75%), while 8 were men

Table 1. *Sociodemographic and general characteristics of the respondents*

		N	%
Gender	**Men**	8	25.0
	Women	24	75.0
Year categories	**36-47 year**	3	9.4
	48-60 year	7	21.9
	61-73 year	11	34.4
	74-85 year	11	34.4
A type of trauma	**Gonarhtrosis**	29	90.6
	Injury	3	9.4
Localization of trauma	**Right knee**	15	46.9
	Left knee	17	53.1

Table 2. *Average values of the quality of life domains before and after surgery*

	Surgery	N	Mean	Std. Deviation	Std. Error Mean	p
Physical functioning	before surgery	**32**	25.56	17.91	4.93	**p = 0.0001**
	after surgery	**32**	53.76	7.37	3.07	
Role limitation due to physical disabilities	before surgery	**32**	40.07	9.53	1.13	**p = 0.0001**
	after surgery	**32**	65.61	14.80	2.62	
Body pains	before surgery	**32**	63.20	10.55	1.91	**p = 0.004**
	after surgery	**32**	55.81	9.92	1.78	
Perception of general health	before surgery	**32**	53.24	17.68	3.13	**p = 0.0001**
	after surgery	**32**	64.76	9.98	1.76	
Energy and vitality	before surgery	**32**	38.64	21.94	3.88	**p = 0.002**
	after surgery	**32**	54.16	16.45	2.91	
Social functioning	before surgery	**32**	38.28	11.76	2.08	**p = 0.0001**
	after surgery	**32**	72.13	10.16	1.80	
Limitations due to emotional difficulties	before surgery	**32**	48.11	5.92	1.71	**p = 0.0001**
	after surgery	**32**	31.93	11.76	1.05	
Mental health	before surgery	**32**	54.35	20.97	3.83	**p = 0.004**
	after surgery	**32**	67.50	16.64	3.04	

(25%). The majority of participants were in the age groups of 61-73 and 74-85 years (11 participants each, 34.4%), while the fewest were in the 36-47 years group (3 participants, 9.3%), and 7 participants (21.9%) were in the 48-60 years group. Regarding the type of trauma, most participants (29, or 90.6%) had gonarthrosis, while 3 had an injury. Out of the 32 participants, 17 (53.1%) had trauma in the left knee, and 15 (46.9%) had trauma in the right knee.

Analysis of the SF-36 Questionnaire

For the purpose of researching quality of life before and after knee replacement surgery, with corresponding healthcare, the standardized SF-36 questionnaire was used. It consists of 36 questions, 35 of which are grouped into 8 different domains: physical functioning, role limitation due to physical difficulties, bodily pain, perception of general health, energy and vitality, social functioning, role limitation due to emotional difficulties, and mental health (38, 39). Within this questionnaire, respondents were given the opportunity to self-assess their health compared to the previous year, both for the period before and after knee surgery.

In the health assessment before surgery compared to the previous year, most respondents (15, or 46.9%) defined their health as the same, 12 (37.5%) characterized it as somewhat worse, while only 5 (15.6%) indicated that it was much worse than a year ago. After surgery, 19 (59.4%) respondents stated that their health was much better compared to the previous year, while the remaining 13 (40.6%) rated their health as somewhat better compared to the previous year. For the period after surgery, there were no negative responses.

In Table 2, the average values of all quality of life domains before and after knee surgery for the total number of respondents (n = 32) are presented. To determine potential differences in all domains of health and quality of life before and after surgery, the paired sample t-test method was used. It is evident that the average health score in the physical functioning domain before surgery (M = 25.56) was significantly lower compared to the period after surgery (M = 53.76). This difference was statistically significant (p = 0.0001).

We tested differences in the role limitation component due to physical difficulties before and after knee surgery using the paired t-test. The results showed that there was also a statistically significant difference in

this domain (p = 0.0001). Before surgery, the average health in the role functioning domain was M = 40.07, and after surgery, there was significant improvement, with an average of M = 65.61, ranging from a minimum of zero to a maximum of 100 on the health scale.

The level of bodily pain before surgery (M = 63.2) was higher compared to the level of bodily pain after surgery (M = 55.81). The paired sample t-test showed that these differences were also statistically significant (p = 0.004).

Regarding the perception of general health, it is evident that respondents perceived their health as much better after surgery (M = 64.76) compared to the period before surgery (M = 53.24). The differences, based on the results of the paired t-test, also proved to be statistically significant in this case (p = 0.0001).

The application of the paired sample t-test confirmed a statistically significant difference in the domain of energy and vitality (p = 0.002). The results show that energy and vitality in the sample patients increased after surgery (M = 54.16), while before surgery, the values in these domains were much lower (M = 38.64).

The level of social functioning also significantly improved in the subjects after surgery (M = 72.13), whereas before the surgery, it was significantly lower (M = 38.28). Differences measured by the paired t-test in this domain also proved to be statistically significant (p = 0.0001).

Limitations due to emotional difficulties were much greater in the subjects before surgery (M = 48.11), while they visibly decreased after surgery (M = 31.93). The observed difference, according to the analysis of the paired sample t-test results, proved to be statistically significant (p = 0.0001).

In the domain of mental health, the results were significantly better after surgery (M = 67.5) compared to the period before surgery (M = 54.35). The differences determined by the paired sample t-test were statistically significant in this domain as well (p = 0.003).

DISCUSSION

The quality of life is influenced by personal development (14). Based on the results of our study, we assessed the quality of life of a sample of patients across eight different domains: physical functioning, role limitation due to physical difficulties, general health perception, bodily pain, energy and vitality, social functioning, role limitation due to emotional difficulties, and mental health. According to previous research, the prevalence of women with an average age of 62-72 who have undergone total knee replacement is higher compared to men. Therefore, our findings align with those results, as the majority of our sample consisted of women (24, or 75%), most of whom were aged 61-73 and 74-85 years (14-19).

In terms of self-assessed health before surgery, compared to the previous year, most respondents defined their health as the same, while after surgery, 19 (59.4%) respondents reported that their health was much better compared to the previous year. Mobility limitations and the development of flexion contractures are cited as some of the most common effects of pathological knee processes, making range of motion an important measure of postoperative outcomes (19).

The study by Walid Kamal M. and associates, as well as many studies before it, found that regular physical activity, especially in the elderly population, significantly improves health, mobility, and quality of life (20, 21). Furthermore, according to the research of Legović A. (22), a significant increase in quality of life was observed in respondents three, six, and twelve months after surgery. Similarly, our research results show that the average health score in the domain of physical functioning before surgery was significantly lower, with health in the domain of physical role functioning showing significant improvement after surgery.

A study that included 41 patients who underwent total knee replacement found that the comparison of preoperative and postoperative quality of life assessments using the SF-36 form showed significant differences at the 5% level in the categories of “somatic pain” and “psychological well-being.” The parameter “somatic functionality” showed almost significant improvement with a p-value of 0.0616. The study concluded that after total knee replacement, an improvement in quality of life could be documented (23).

According to the findings of certain authors (19), pain is an essential measure of postoperative outcomes. Alleviating pain significantly improves a patient’s quality of life and their ability to perform functional activities. In line with these findings, the results of the same authors’ research showed significant improvement in terms of pain reduction, as measured by the Visual Analog Scale (VAS). Our research results follow the same trend, with the level of bodily pain before surgery being higher than the level of bodily pain after surgery.

It is evident that our respondents perceived their health as much better after surgery compared to the period before surgery, and energy and vitality in these patients increased after surgery. The relationship between impairment and limitations in participation in activities is largely determined by the type of illness, but contextual factors such as social support and/or work demands also play a crucial role. Accordingly, the level of social functioning also significantly im-

proved in respondents after surgery, whereas it was significantly lower before surgery (19).

According to various literature sources, pain from osteoarthritis can significantly reduce mobility and participation in daily activities, becoming a major source of stress, affecting both the body and mind, and manifesting as panic attacks and deteriorating general health. The findings of the mentioned research have proven that psychological conditions such as anxiety and depression correlate with pain intensity and lower functional ability in people suffering from hip and knee osteoarthritis (24).

In the research results of Šantić V. et al., statistically significant improvements were evident after surgery, measured in terms of physical function, role limitations due to physical problems, social function, energy and vitality, pain, general health, and role limitations due to emotional problems, except in the domain of mental health, where statistically significant improvement was not found. If we summarize our research, it is evident that it correlates with the aforementioned study, where statistically significant improvements were found in the same domains, including mental health (25).

Considering that quality of life is a subjective assessment, differences in coping with illness, fears, and emotional control strategies are to be expected. Women over the age of 60 have worse physical functioning than younger women. Additionally, older women have greater limitations in performing their roles due to emotional problems, vitality, mental health, and social functioning. High stress levels, memory issues, and fear of illness are factors that can potentially affect mental health and usually occur alongside treatment (26).

Accordingly, the results showed that limitations due to emotional difficulties were much greater in respondents before surgery, while in the domain of mental health, results were significantly better after surgery. Based on the obtained results, statistical significance was achieved in all domains of quality of life, indicating that the quality of life of patients improved after total knee replacement surgery compared to the preoperative period.

The limitation of our study lies in the sample of patients who were operated on in the Clinical Centre of Montenegro without considering patients who were not operated on and who underwent alternative therapeutic methods and rehabilitation.

Further research should focus on early recognition of patients with knee diseases, as these individuals experience limitations in both their quality of life and ability to work. It is especially important to emphasize early disease detection and rehabilitation to prevent future adverse health and economic consequences for patients with knee conditions. Additionally, it is essential to design preventive programs at the primary level of healthcare**.**

CONCLUSION

According to the criteria of the instrument used in this research, it is evident that before surgery, respondents experienced difficulties in all domains of patient quality of life covered by this survey instrument. When providing quality healthcare, attention should be focused on the patient and their needs to maintain and improve their safety, satisfaction, independence, and recovery. At the forefront of recovery through proper healthcare, patients need guidance and education on potential limitations, the risks of not following instructions, the use of assistive devices, and the implementation of physical exercises to improve health. Healthcare facilitates the patient's recovery as quickly as possible and allows for the gradual increase of daily activities according to their capabilities. Along with medical-technological advances and established treatment standards, healthcare ensures comprehensive quality, safety, and continuity of healthcare procedures to protect health. Accordingly, the analysis of patients' quality of life after total knee replacement surgery, with adequate healthcare, in our study demonstrated significant improvements in quality of life across various domains compared to the preoperative period.

Abbreviations

HRQoL - Health-related quality of life
PCS - Physical Component Summary Measure
MCS - Mental Component Summary Measure
VAS - Visual Analog Scale
WHO - World Health Organization

Author contributions: Conceived the idea for the study, participated in the writing of the paper KM. Conceptualization of BM and RK. Methodology and validation: KM, BM and RK. Formal analysis, writing, review, editing, investigation and supervision DP. All authors discussed the results and contributed to the final manuscript.

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Sažetak

KVALITET ŽIVOTA PACIJENATA NAKON UGRADNJE TOTALNE ENDOPROTEZE KOLENA

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Uvod: Bolesti sistema za kretanje česte su bolesti u opštoj populaciji. One značajno utiču na porast morbiditeta, češće korišćenje zdravstvene zaštite, smanjenje radne sposobnosti, porast profesionalnog apsentizma i nastanak invalidnosti.

Metodologija: U ovom istraživanju su učestvovali ispitanici (pacijenti) sa ugrađenom endopretezom kolena u Kliničkom Centru Crne Gore – Podgorica. Koristili smo istraživačku metodu univerzalnog standardnog upitnika SF 36 koji je najšire primenjivan na više od 4 000 objavljenih publikacija.

Rezultati: Poboljšanje kvaliteta života pacijenta, u svim ispitivanim domenima (fizičko funkcionisanje p = 0,0001; ograničenje funkcije pokreta zbog fizičkih problema p = 0,0001; ograničenja funkcionisanja zbog emocionalnih problema p = 0,0001; vitalnost/energija p = 0,0002; mentalno zdravlje p = 0,0004 socijalno funkcionisanje p = 0,0001; opšte zdravlje p = 0,0001), identifikovano je nakon ugradnje endoproteze kolena.

Zaključak: Budući da su u svim domenima kvaliteta života dobijene statistički značajne razlike u rezultatima pre i nakon operacije ugradnje endoproteze kolena, potvrđeno je da se kvalitet života pacijenata nakon ugradnje endoproteze kolena poboljšao.

Ključne reči: endoproteza kolena, kvalitet života, invaliditet, radna sposobnost.

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