

QUALITY OF LIFE IN OSTEOARTHRITIS KNEE UNDERGOING TOTAL KNEE ARTHROPLASTY, SURANAREE UNIVERSITY OF TECHNOLOGY HOSPITAL

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Abstract

Outcomes of total knee arthroplasty (TKA) were related to patients' quality of life. Our study is to find the associated factors in the quality of patients' life who underwent TKA at Suranaree University of Technology Hospital. The study collected the data from 135 patients who underwent TKA and followed up their quality of life before and after surgery at 1, 3, 6, and 9 months, 1, 2, and 3 years. Demographic data, the severity of osteoarthritis by using Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), levels of activities in daily living and sports activities by using International Knee Documentation Committee Subjective Knee Form (IKDC), pain score by using Visual analogue scale (VAS), and duration of using crutches were analyzed by repeated measure ANOVA and multiple regression analysis. The results found that WOMAC score and pain score was significantly decreased after 1 month of surgery. IKDC score was significantly increased after 1 month of surgery and slightly decreased after 3 months of surgery. The associated factors with the WOMAC score were levels of education, annual income, and BMI. The IKDC score was associated with the IKDC score before surgery, and the pain score was associated with levels of education. This study points out that healthcare providers should explain clearly to the patients that after 1 month of surgery, their quality of life would be gradually improved. Patients should avoid extreme activities using their knees after the surgery for 3 months and should control their body weight for better outcomes.

Keywords: Knee, osteoarthritis, quality of life, Total Knee Arthroplasty

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Introduction

At present, the prevalence of patients diagnosed with osteoarthritis increases every year from 21.6% in 2005 to 23.5% in 2015, and it will increase by 25% in 2030 (Turkiewicz *et al.*, 2014; Osteoarthritis Research Society International, 2016). The knee replacement surgery is also increasing every year. A prior study found that only 82% of the patients who underwent knee replacement surgery were satisfied with the surgery outcomes, and 19% of the patients were dissatisfied after the surgery (Bourne *et al.*, 2010). When comparing between the satisfaction of the patients and the surgeon with the outcomes of surgery, the patients' satisfaction was 90.3% and the surgeons' satisfaction was 94.5%, so the patients were less satisfied than the surgeons (Lau *et al.*, 2012; Harris *et al.*, 2013; Matsuda *et al.*, 2013). The associated factors with the quality of life after surgery were age, gender, education level, income, ability to perform various activities post-surgery, patient expectation about the best result from surgery, regular exercise, severity of osteoarthritis symptoms, and duration of medical treatment (Meeprasert, 2010; Sasichantra, 2010). This study was different from previous studies by investigating the quality of life of patients who did Total Knee Arthroplasty (TKA) by long-term follow-up for 3 years (first follow-up was 1 month, then 3 months, 6 months, 9 months, 1 year, 2 years, and 3 years after surgery, respectively). We noticed an obvious change in the quality of life in the long-term, and the results are more clearly observed. This research used various tools to assess the quality of life, which consisted of the severity of osteoarthritis of the knee (WOMAC Score), levels of ability in activities of daily living and sports activities (IKDC Score), and the Pain Score.

The study examined associated factors with the quality of life of patients who underwent TKA. The expected result from this study will be useful for the development of the new treatment processes and the best guidelines of care for TKA patients to have a better quality of life.

Materials and Methods

Study Population and Collecting Data

The study used data from the secondary database, which included the data of 135 osteoarthritis patients who underwent TKA at Suranaree University of Technology Hospital (SUTH). The surgery is performed by the same doctor and the same surgical technique for TKA during 1st January 2016 to 31st December 2018. Data collection was conducted by patients' appointment

for pre-surgery and post-surgery. The follow up periods after surgery consisted of 1 month, 3 months, 6 months, 9 months, 1 year, 2 years and 3 years. About 100 patients who had followed up after surgery until 3 years. The tools used in this study were 5 items as following 1) personal patient's data, 2) the severity of osteoarthritis knee (WOMAC Score), 3) level of symptoms in daily activities and sports activities (IKDC Score), 4) pain score data, and 5) duration of using gait aid or crutches. The WOMAC Score has a Cronbach's alpha of 0.917 and the IKDC Score has a Cronbach's alpha of 0.92. (Lertwanich *et al.*, 2008; Ebrahimzadeh *et al.*, 2014) The flow diagram of quality of life of osteoarthritis knee patients undergoing TKA at SUTH is shown in Figure 1.

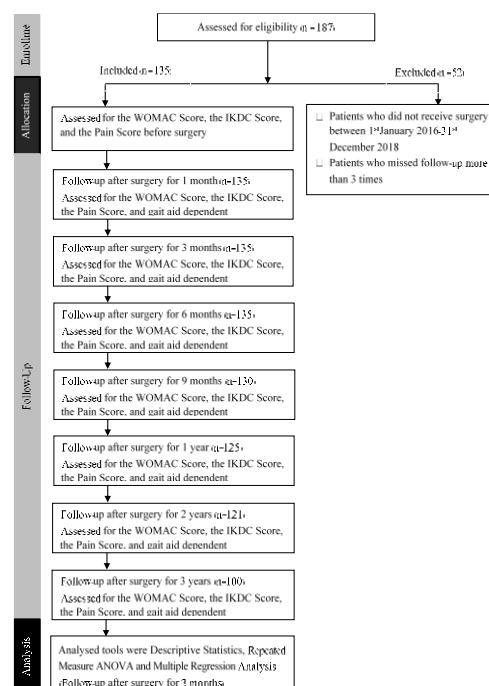


Figure 1. Flow diagram of Quality of Life in Osteoarthritis Knee Patients undergoing Total Knee Arthroplasty at Suranaree University of Technology Hospital

Definition of Terms

Osteoarthritis (OA) is defined as a type of joint disease that results from breakdown of joint cartilage and underlying bone.

Total Knee Arthroplasty (TKA) is defined as the surgical procedure to resurface a damaged knee by arthritis. Metal and plastic parts are used to cap the ends of the bones that form the knee joint, along with the kneecap.

Quality of life in knee osteoarthritis patients after total knee arthroplasty consists of the severity of osteoarthritis of the knee (WOMAC Score), the levels of ability in activities of daily living and sports activities (IKDC Score), and the Pain Score.

Data Analysis

The data of 135 osteoarthritis patients who underwent TKA. Analysis of the study, continuous variables; age, annual income and body mass index (BMI), were calculated as mean value $\pm$ standard deviation (SD), median and interquartile range (IQR). Categorical variables; gender, age, education level, annual income, BMI and the duration of dependence on crutches to walk after surgery, were calculated as percentage. About 100 patients were followed up after surgery 3 years and were analyzed by using repeated measures analysis of variance (Repeated Measures ANOVA) and Least-Significant Different method (LSD) to compare mean difference scores quality of life of knee osteoarthritis patients after TKA consisting of the severity of osteoarthritis of the knee (WOMAC Score), the levels of ability in activities of daily living and sports activities (IKDC Score), and the Pain Score. 95% confidence interval was reported for the associated factors with the quality of life after TKA using multiple regression analysis. Statistical significance test was considered at 2 sides with p -value <0.01 and <0.05 . Data were recorded in Excel software and analyzed by using IBM SPSS Statistics for Windows.

This study was reviewed and approved by the ethics committee of Mahidol University code 2019/242 (B1) and the ethics committee of Suranaree University of Technology code EC-62-84.

Results

Demographic data of the study population are presented in Table 1. Most of the osteoarthritis patients who underwent TKA are female (85.2%), their mean age is 66.61 ± 8.18 years and between 61-70 years (42.2%), followed by older than 70 years (31.1%). For level of education, most of the patients completed primary education or lower (62.2%) and have income less than or equal to 50,000 baht per year (50.4%), and have a body mass index (BMI) between 25.00-29.99 kg/m^2 , (43.7%) and equals or greater than 30, (34.1%), respectively.

Table 1. Demographic data of the study population

Demographic data (n = 135)	n (%)
Sex	
Male	20 (14.8%)
Female	115 (85.2%)
Age (years)	
< 60	36 (26.7%)
60-70	57 (42.2%)
> 70	42 (31.1%)
Mean $\pm$ SD	66.61 ± 8.18
Education levels	
Primary education	84 (62.2%)
Secondary education or diploma	28 (20.8%)
Bachelor's degree or higher	23 (17.0%)
Annual income (Baht)	
$\leq 50,000$	68 (50.4%)
50,001-200,000	31 (22.9%)
> 200,000	36 (26.7%)
Mean $\pm$ SD, Median, IQR	$232,933.33 \pm 556,818.29$, Median =50,000, IQR =20,000-240,000
Body Mass Index (BMI)	
≤ 22.99	15 (11.1%)
≥ 23.00	120 (88.9%)
Mean $\pm$ SD	28.35 ± 4.41

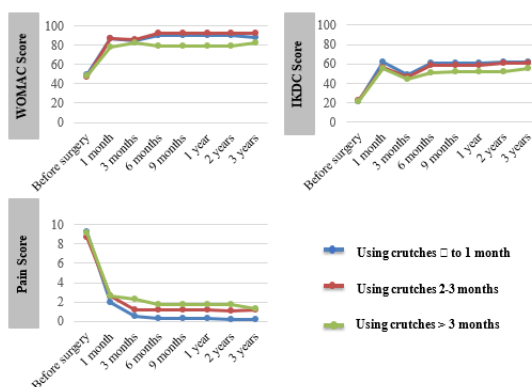


Figure 2. The duration of using crutches to walk after surgery and quality of life of osteoarthritis patients who underwent total knee arthroplasty

For the duration of using crutches to walk after surgery, the patients had the least amount of time for 2 weeks to use crutches and a maximum of 24 months. Most of the patients (43.7%) stopped using crutches 2-3 months after surgery, followed by less than or equal to 1 month (38.5%). However, 17.8% of the patients used crutches for more than 3 months after surgery and had higher severity levels of osteoarthritis than the other groups. Also, they had lower levels of ability to do activities of daily living and sports activities than the other groups, and had higher pain levels than the other groups in all points of the follow-ups, as shown in Figure 2 below.

The severity levels of osteoarthritis (WOMAC Score) before surgery (WOMAC Score = 47.45) and after surgery were significantly different ($p < 0.01$). The severity significantly decreased after 1 month

of surgery (WOMAC Score = 86.71), but 3 months after the surgery, the intensity increased slightly (WOMAC Score = 84.65) and then decreased and was stable at 6 months, 9 months, 1 year, and 2 years (WOMAC Score = 88.18, 88.18, 88.18 and 88.18, respectively). After that, the severity of osteoarthritis increased at 3 years after surgery (WOMAC Score = 88.36). The levels of ability in activities of daily living and sports activities (IKDC Score) before surgery (IKDC Score = 21.09) and after surgery were significantly different ($p < 0.05$). That is, after surgery, the mean IKDC Score clearly increased at 1 month (IKDC Score = 62.00) (increased ability to do activities of daily living and sports activities). At 3 months after surgery, the mean IKDC Score decreased (IKDC Score = 47.81) and then increased and was stable at 6 months, 9 months, 1 year, 2 years and 3 years after surgery (IKDC Score = 59.30, 59.30, 59.30, 59.30, and 60.08, respectively). The difference between Pain Score before surgery (Pain Score = 9.11) and after surgery was statistically significant ($p < 0.01$) which means that after surgery the Pain Score decreased. At 1 month after surgery, the Pain Score clearly decreased (Pain Score = 2.07). At 3 months after surgery, the Pain Score decreased and remained stable at the 6 months, 9 months, 1 year, 2 years, and 3 years after surgery (Pain Score = 0.84, 0.73, 0.73, 0.73, 0.73, and 0.73, respectively), as shown in Table 2 below.

The quality of life of osteoarthritis patients who underwent TKA clearly increased at 1 month after surgery, then at 3 months after surgery, the quality of life decreased. So, this study analyzes the associated factors with the quality of life during the 3 months follow-up period. The associated factors with the severity of osteoarthritis knee (WOMAC Score) were secondary education or diploma ($B = -4.72$, 95%CI -7.23--2.21; $p < 0.01$), annual income ($B = 0.00$, 95%CI 0.00-0.00; $p < 0.05$), and body mass index (BMI) ($B = -0.25$, 95%CI -0.49-0.01; $p < 0.05$). The associated factor with the levels of ability in activities of daily living and sports activities (IKDC Score) was the IKDC Score before surgery ($B = 0.45$, 95%CI 0.01-0.89; $p < 0.05$), and the associated factor with the pain score was level of education as the secondary education or diploma ($B = 1.49$, 95%CI 0.75-2.24; $p < 0.01$), as shown in Table 3 below.

Discussion

This study collected the data from 135 osteoarthritis patients who underwent TKA in SUTH to find the associated factors in the quality of patients' life. We found that most osteoarthritis patients were female and their overweight ($BMI \geq 23.00 \text{ kg/m}^2$). In the middle-aged women, which is the period towards

Table 2. The quality of life of osteoarthritis patients who underwent total knee arthroplasty

Quality of life	Follow-up schedule	Mean	Follow-up schedule							
			Before surgery	1 month	3 months	6 months	9 months	1 year	2 years	3 years
WOMAC Score (n = 100)	Before surgery	47.45								
	1 month	86.71	39.26**							
	3 months	84.65	37.20**	-2.06**						
	6 months	88.18	40.73**	1.47	3.53**					
	9 months	88.18	40.73**	1.47	3.53**	0.00				
	1 year	88.18	40.73**	1.47	3.53**	0.00	0.00			
	2 years	88.18	40.73**	1.47	3.53**	0.00	0.00	0.00		
	3 years	88.36	40.91**	1.65	3.71**	0.18	0.18	0.18	0.18	
IKDC Score (n = 100)	Before surgery	21.09								
	1 month	62.00	40.91**							
	3 months	47.81	26.72**	-						
				14.19**						
	6 months	59.30	38.21*	-2.70	11.49**					
	9 months	59.30	38.21*	-2.70	11.49**	0.00				
	1 year	59.30	38.21*	-2.70	11.49**	0.00	0.00			
	2 years	59.30	38.21*	-2.70	11.49**	0.00	0.00	0.00		
	3 years	60.08	38.99**	-1.92	12.27**	0.78	0.78	0.78	0.78	
Pain Score (n = 100)	Before surgery	9.11								
	1 month	2.07	-7.04**							
	3 months	0.84	-8.27**	-1.23**						
	6 months	0.73	-8.38**	-1.34**	-0.11					
	9 months	0.73	-8.38**	-1.34**	-0.11	0.00				
	1 year	0.73	-8.38**	-1.34**	-0.11	0.00	0.00			
	2 years	0.73	-8.38**	-1.34**	-0.11	0.00	0.00	0.00		
	3 years	0.73	-8.38**	-1.34**	-0.11	0.00	0.00	0.00	0.00	

** $p < 0.01$, * $p < 0.05$, a; mean difference scores between quality of life and follow-up periods

Table 3. The associated factors with the quality of life after total knee arthroplasty during the 3-month follow-up period

Parameter	WOMAC Score		IKDC Score		Pain Score	
	B	95% CI	B	95% CI	B	95% CI
Sex						
Male	0.00	0.00 - 0.00	0.00	0.00 - 0.00	0.00	0.00 - 0.00
Female	-0.63	-3.45 - 2.18	3.55	-0.87 - 7.97	0.33	-0.52 - 1.18
Age (years)	-0.05	-0.18 - 0.08	-0.19	-0.39 - 0.01	0.01	-0.03 - 0.04
Education levels						
Primary education	0.00	0.00 - 0.00	0.00	0.00 - 0.00	0.00	0.00 - 0.00
Secondary education or diploma	-4.72	-7.23 - -2.21**	0.76	-3.19 - 4.70	1.49	0.75 - 2.24**
Bachelor's degree or higher	-0.17	-3.20 - 2.87	3.85	-0.92 - 8.62	0.19	-0.72 - 1.10
Annual income (baht)	0.00	0.00 - 0.00*	0.00	0.00 - 0.00	0.00	0.00 - 0.00
BMI	-0.25	-0.49 - -0.01*	-0.16	-0.53 - 0.21	0.06	-0.02 - 0.13
WOMAC Score Before surgery	0.03	-0.05 - 0.12	-0.05	-0.19 - 0.08	0.00	-0.03 - 0.03
IKDC Score Before surgery	-0.12	-0.40 - 0.17	0.45	0.01 - 0.89*	0.05	-0.04 - 0.13
Pain Score Before surgery	-0.36	-1.01 - 0.30	0.65	-0.38 - 1.68	0.09	-0.10 - 0.29
Constant	101.26	85.44 - 117.08**	47.19	22.34 - 72.04**	-3.21	-8.00 - 1.58

** $p < 0.01$, * $p < 0.05$

elderly in which the estrogen levels reduce, these hormones help absorb calcium ions in the bloodstream to store in the bones. The above reason causes fragile bones and osteoarthritis (Meeprasert, 2010; Cooper *et al.*, 2013).

The severity of osteoarthritis of the knee (WOMAC Score) was extreme before surgery but it decreased after 1 month after the surgery and intensity increased slightly 3 months after the surgery. The WOMAC Score was higher from 6 months to 3 years after surgery. We found that at 3 months after surgery, the severity of osteoarthritis and being overweight were the causes of longer recovery period. Contrast to the previous studies that the patients' WOMAC score was better within 1 year after surgery (Bachmeier *et al.*, 2001), this finding was related with the levels of ability in activities of daily living and sports activities (IKDC Score) and the Pain Score (Núñez *et al.*, 2007; Saengthon *et al.*, 2019). The most important finding of this study was that a month after TKA, the pain decreased significantly and their knees returned to fully function so the patients had better quality of life. However, 3 months after surgery, the quality of life slightly decreased because of the excessive use of their knees. They were familiar with their knees at 6 months, 9 months, 1 year and 2 years, then their quality of life slightly increased and remained stable. Patients would have pain and joint stiffness and would have difficulty in movement and doing daily activities. The patients who had less ability in activities of daily living and sports activities before surgery had a longer recovery period. After surgery, the most important finding of this study was that some osteoarthritis patients used the crutches for more than 3 months. This group had lower quality

of life than the other groups because most of the patients were overweight which caused longer duration for recovery. Using crutches after surgery could affect the quality of life or daily activities. The patients with BMI in the obesity (BMI > 30) had the lowest mean quality of life (Vincent *et al.*, 2010; Polsa, 2016). In addition, the patients who had secondary education or diploma had higher pain levels after surgery than the other groups, and they were overweight. These factors were the cause of longer recovery period, which is similar to previous studies which found that the severity of osteoarthritis was associated with BMI. The patients who had lower ability to do activities of daily living were associated with lower ability to do exercise (Meeprasert, 2010; Sasichantra, 2010; Veenhof *et al.*, 2012).

The strength of this study was investigating the quality of life of patients who did Total Knee Arthroplasty (TKA) by long-term follow-up periods for 3 years after surgery. We noticed an obvious change in the quality of life in the long-term, and the results are more clearly observed. This study used various tools to assess the quality of life, which consisted of the WOMAC Score, the IKDC Score, and the Pain Score but all of the assessment tools for quality of life are the self-assessment questionnaires then every patient who answered the questionnaires had different aspect. And this research study used secondary data and the data did not have any details of the assessment tools.

The healthcare professionals should explain clearly to patients that; 1) the quality of life after TKA will be better during 1 month after surgery, 2) during 1-3 months after surgery the patients should not use the knee to do heavy activities, 3) they need

time for the knee to recover and can return to use the knee during 6 months after surgery, 4) the patients who are overweight should lose weight because it will improve their quality of life after surgery, allowing shorter recovery period, and shorter duration of using crutch, 5) it is recommended that the patients have to use the crutches for walking regularly during 1-3 months after surgery although the knee pain is getting less, and 6) the home visit program could improve the severity of osteoarthritis (WOMAC Score) during the first 6 weeks. The home visit program could solve the problem of social inequality, for instance, education, socioeconomic, etc. (Sindhupakorn *et al.*, 2019). Those were the education levels were correlated with quality of life in the health dimension (Chuenim, 2012).

Conclusions

This study found that the quality of life of osteoarthritis patients who underwent TKA clearly increased at 1 month after surgery, then at 3 months after surgery, the quality of life decreased and later increased, before it was stable at 6 months, 9 months, 1 year, 2 years, and 3 years after surgery. The healthcare professionals should explain clearly to the patients that after 1 month of surgery, their quality of life will be gradually improved. However, they should avoid their extreme activities which can affect their knees after the surgery. They have to use the crutches for walking regularly during 1-3 months after surgery although the knee pain is less. Their knees will fully recover after 6 months of the surgery, and they should control their body weight for better outcomes. For further research, SUTH should develop the information system for collecting data on osteoarthritis patients who undergo total knee arthroplasty. The healthcare professionals can use this information to study the patients' quality of life. The researchers should study the duration of using crutches after surgery with the other factors and develop a mixed method study in order to explain more clearly about the quality of life of osteoarthritis patients.

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